CSM Unit 1, Upper Watersheds

Upper South Fork Coeur d'Alene River

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ABBREVIATIONS AND ACRONYMS

AWQC	Ambient Water Quality Criteria
Belt	Belt Supergroup
BLM	Bureau of Land Management
cfs	cubic foot per second
COPC	chemical of potential concern
CSM	conceptual site model
CV	coefficient of variation
EPA	U.S. Environmental Protection Agency
EV	expected value
FS	feasibility study
IDEQ	Idaho Division of Environmental Quality
MCL	maximum contaminant level
MFG	McCulley, Frick & Gilman, Inc.
µg/L	microgram per liter
msl	mean sea level
NPDES	National Pollution Discharge Elimination System
PDF	probability density function
PRG	preliminary remediation goal
RI/FS	remedial investigation/feasibility study
RI	remedial investigation
SFCDR	South Fork Coeur d'Alene River
SFCDRSeg	South Fork Coeur d'Alene River Segment
SL	screening level
South Fork	South Fork Coeur d'Alene River
TMDL	total maximum daily load
Upper South Fork	Upper South Fork Coeur d'Alene River
URSG	URS Greiner, Inc.
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
WRCC	Western Regional Climate Center

1.0 INTRODUCTION

The Upper South Fork Watershed is located within the Coeur d'Alene River basin and encompasses the headwaters of the South Fork Coeur d'Alene River (South Fork). The Bureau of Land Management (BLM) has identified 229 source areas (e.g., mining waste rock dumps, adits, and jig and flotation tailings piles) within the watershed (BLM 1999). The watershed has been affected by mining activities and hazardous substances have been and continue to be released into the environment.

Several clean-up actions have been implemented in the upper South Fork Coeur d'Alene River watershed above Wallace. These actions include several local actions identified to protect human health, and other response actions as implemented by the mining companies and the Union Pacific Railroad. During the 1998 and 1999 field seasons, the USACE on behalf of USEPA performed several residential soil cleanups determined to be necessary to protect human health. These actions include removals at 5 residential properties within this portion of the watershed, and a localized removal at the Mullan City Park (USEPA 1999, and USEPA 2000b). In addition, localized removals with replacement by wood chips were conducted beneath the play equipment at the Mullan Elementary School (USEPA 2000c). Material from these removal actions was disposed of at the CIA (USEPA 1999 and USEPA 2000a).

In 1989, Hecla directed adit drainage from the Morning Mine No. 6 Adit to a subsurface flow rock-bed filter treatment system located on top of the Morning Mine waste rock dump. Water quality data indicates variable effectiveness (Harvey 2000).

As a part of the Consent Decree for the Union Pacific Railroad (UPRR) Wallace-Mullan Branch, contaminated soils and right of way ballast within the UPRR (ROW) along the SFCDAR above Wallace are to be covered with an asphalt, gravel or soil barrier, depending upon location. This action also includes limited removals of contaminated materials within selected railroad sidings in Mullan, and near the Lucky Friday Waste Impoundment. Thirty-two (32) residential areas that are located within or encroaching onto the UPRR ROW are to be sampled as a part of this action; depending upon sample results, any residual contamination adjacent to these homes will be addressed. This action also includes fencing as access control around encroachments onto the ROW by the Hecla Lucky Friday Tailings Pond and the Morning Mine Waste Dump. A channel with wetlands planting is also included to collect identified seeps from the toe of the Morning Mine Waste Dump which discharges to the South Fork through a National Pollutant Discharge and Elimination System (NPDES) outfall (MFG 1999). Implementation of this portion of the UPRR Response Action is also planned for the year 2000/2001 (MFG 2000).

This watershed is one of eight watersheds assigned to conceptual site model (CSM) Unit 1, Upper Watersheds (see Part 1, Section 2, Conceptual Site Model Summary). The watershed itself is entirely within one segment (Figure 1.1-1). A brief description of the Upper South Fork Watershed is presented in this section.

1.1 SEGMENT DESCRIPTION

This segment is the easternmost portion of land studied in the basin. It starts at the headwaters of the South Fork and continues to the confluence with Canyon Creek (Figure 4.1-1). The eastern portion of this segment, containing the headwaters, has limited impacts from mining-related activities. Mining-related impacts to the floodplain and stream banks become increasingly apparent downstream from Larson. Throughout this segment, the Upper South Fork is located adjacent to Interstate 90. Between the Lucky Friday Mining Complex and Wallace, the river has been extensively channelized, resulting in degraded water quality and ecological habitat conditions.

Water quality also declines from the headwaters to Wallace. Above Larson, metals concentrations rarely exceed ambient water quality criteria (AWQC). From Larson down to Wallace, AWQC are regularly exceeded. The effects of degraded habitat and water quality are reflected in the observed fish populations. Trout populations throughout the segment are comparable to those observed in reference streams and other less modified watersheds in the basin. However, densities of sculpin, a species demonstrated to be sensitive to metals contamination and habitat disturbance, are highest in the headwaters and decrease to zero near Wallace, at the confluence of the South Fork with Canyon Creek (Maret 2001).

1.2 REPORT ORGANIZATION

The remedial investigation report is divided into seven parts. This report on the Upper South Fork Watershed is one of eight reports contained within Part 2 presenting the remedial investigation (RI) results for the eight CSM Unit 1 upper watersheds. The content and organization of this report are based on the U.S. Environmental Protection Agency's (EPA) *Guidance Document for Conducting Remedial Investigations and Feasibility Studies under CERCLA, Interim Final* (USEPA 1988). This report contains the following sections:

- Section 2–Physical Setting, includes discussions on the watershed's geology, hydrogeology, and surface water hydrology.

- Section 3–Sediment Transport Processes

- Section 4–Nature and Extent of Contamination, includes a summary of chemical results and estimates of mass loading from source areas

- Section 5–Fate and Transport, includes chemical and physical transport processes for metals

- Section 6–References

Risk evaluations and potential remedial actions associated with source and depositional areas are described in the human health risk assessment, the ecological risk assessment, and the feasibility study (all under separate cover).

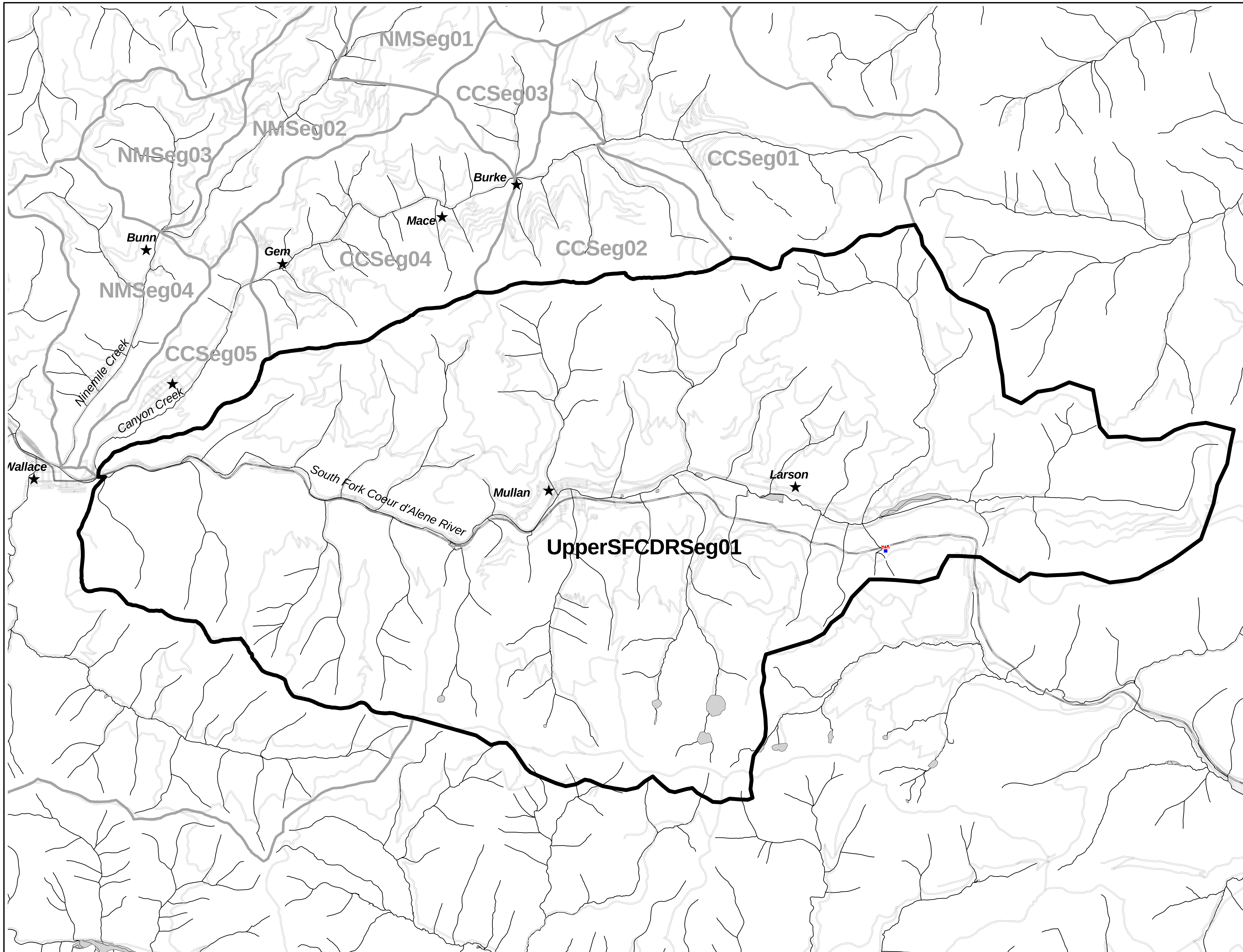
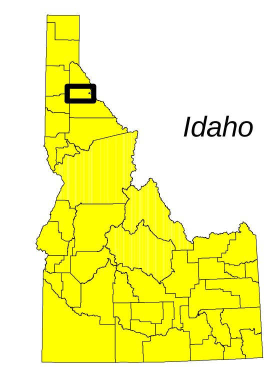


Figure 1.1-1
Upper South Fork Coeur d'Alene River Watershed

LEGEND

- Stream
- Road
- Interstate 90
- ★ City
- Upper South Fork Coeur d'Alene River Watershed
- River Segment
- Lake/River



Location Map

NOTES

1) **Base map coverages obtained from the Coeur d'Alene Tribe, URS Greiner Inc., CH2M HILL, and the Bureau of Land Management.**

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Coeur d'Alene Basin RI/FS
RI/FS REPORT

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This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: July 24, 2001

2.0 PHYSICAL SETTING

2.1 GEOLOGY AND MINES

The geology and mining history of the Upper south Fork Watershed are discussed in this section.

2.1.1 Geomorphic Setting

The Upper South Fork Watershed encompasses the headwaters of the South Fork Coeur d'Alene River (South Fork) (Part 1, Figure 1.2-2). The South Fork flows westerly and is the principal drainage of the watershed. Tributaries to the South Fork are roughly north-south-trending, typically 2 to 3 miles in length. The headwaters of the tributaries are typically located at elevations ranging from 5,700 to 6,800 feet. The elevation of the South Fork ranges from 6,000 feet above mean sea level (msl) near Mullan Pass to about 3,000 feet above msl near Wallace (Part 1, Figure 1.2-2). Floodplain development along the South Fork starts east of Larson. Downstream of Larson or westerly, the floodplain widens to about 0.25 mile (Part 1, Figure 3.2-2).

2.1.2 Bedrock Geology

Weakly metamorphosed sedimentary rocks assigned to the Precambrian Belt Supergroup are the dominant rocks within the Upper South Fork Watershed (Part 1, Figure 3.2-2). The Wallace Formation (argillite and quartzite, often carbonate-bearing) and St. Regis Formation (consisting of either argillite, quartzite, or lesser amounts of limestone) are the most prevalent formations in the watershed. Lesser amounts of Revett Formation (quartzite) and Burke Formation (dominantly a quartzite) are also present in the watershed.

Roughly parallel to the South Fork channel is the Osburn Fault. The geologic contact between the Wallace Formation and outcrops of Burke, Revett, and St. Regis Formations is controlled by the Osburn Fault (Part 1, Figure 3.2-2).

2.1.3 Structural Geology

Faults that dominate the structural fabric of the watershed are roughly east-west trending. The Osburn Fault is the principal structure of the watershed (Hobbs et al. 1965). Approximately 16 miles of right-lateral displacement has occurred along this fault. The Osburn Fault is roughly paralleled by the Paymaster Fault to the north; the D-6 Fault about 2 miles to the south; and the

Placer Creek Fault about 3 miles to the south (Part 1, Figure 3.2-2). The Golconda, Friday, Reindeer, National, and Snowstorm faults are the ore-controlling structures for the Golconda, Lucky Friday, Reindeer Queen, National, and Snowstorm Mines, respectively (Part 1, Figure 3.2-3). These ore-controlling faults are all east-west-trending with the exception of the northwest-trending National Fault (Part 1, Figure 3.2-2).

Two distinct patterns of folding (which predates the faulting [Hobbs and Fryklund 1968]) are evident in the watershed. The weakly metamorphosed sedimentary units are folded along north-south fold axes to the north of the Osburn Fault throughout the watershed (Hobbs et al. 1965). To the south of the Osburn Fault, the sedimentary rocks are folded along east-west fold axes throughout the watershed (Hobbs et al. 1965). Folding in the basin is not depicted on the geologic map presented in Part 1, Figure 3.2-2.

2.1.4 Soils

Soils of the Upper South Fork Watershed can be grouped into two broad categories: hillside soils and valley soils. Hillside soils typically consist of silty loam with variable amounts of gravels and clay, generally less than 2 feet thick (MFG 1992; Camp Dresser & McKee 1986). Valley soils are found within and along the flanks of the South Fork, particularly in the vicinity of Mullan (Part 1, Figure 3.2-2). The valley soils typically consist of gravel, sand, and silt deposited on valley bottoms; in some areas.

2.1.5 Ore Deposits

The Upper South Fork Watershed drains the following mineral belts: Rex-Snowstorm, Gem-Gold Hunter, Golconda-Lucky Friday, and Moe-Reindeer (Part 1, Figure 3.2-3). Ore deposits in the Upper South Fork Watershed are primarily lead-zinc-silver-copper-gold fissure-vein deposits, which typically occur as steeply dipping veins. In some deposits in this watershed, ore also occurs as replacement deposits along bedding planes. Quartzite of either the Wallace, St. Regis, Burke, or Revett Formations hosts the largest deposits in the watershed.

The principal ore minerals are the sulfides galena, sphalerite, tetrahedrite, and chalcopyrite. Galena is the main ore mineral of lead, and also yields considerable silver. Tetrahedrite also yields considerable silver, along with copper. Chalcopyrite is the principal ore mineral of copper, and sphalerite is the main ore mineral of zinc. Associated non-ore sulfide minerals are pyrite and pyrrhotite, and volumetrically these sulfides are probably routinely less than 2 to 3 percent of the mineralogical content of the orebodies (Ransome and Calkins 1908; Umpleby and Jones 1923).

Non-ore gangue minerals are quartz, siderite (an iron carbonate), barite (in some mines such as the Morning-Star and Gold Hunter), cerrusite (a lead carbonate, abundant in the Morning-Star), and very minor amounts of calcite (calcium carbonate) and magnetite (Ransome and Calkins 1908; Umpleby and Jones 1923). Compared to the mineralogy of ore deposits in other watersheds, the carbonate mineral content of the ore deposits in the Upper South Fork Watershed is relatively high.

2.1.6 Mining History

A brief summary of available information on historical mining activities is presented in this section. During the RI/FS process, an extensive list of mines, mills, and other source areas was developed based on a list originally developed by the Bureau of Land Management (BLM 1999). This list is presented in Section 4.1, Nature and Extent, and in Appendix I.

Mining in the Upper South Fork began in the 1880s. Like the rest of the Coeur d'Alene district, the mines of the Upper South Fork were known mainly for silver, lead, and zinc production. Some copper mines were also located in this area (Quivik 1999).

One of the first and most important mines located in this area was the Gold Hunter. By 1888, the Gold Hunter was extracting sufficient volumes of ore to justify construction of a mill to concentrate its ores. Concentration of the ore consisted of removing low-grade material from the ore, which yielded a product of high-grade material that could be more economically shipped for smelting. Typical of milling operations of its time, the Gold Hunter used gravity separation equipment such as jigs and vanners to remove low-grade waste products from the high-grade ore. Power for many of the early mills was provided by water of the South Fork and its tributaries. These surface waters also provided a convenient disposal method for the tailings that resulted from the concentration process (Quivik 1999).

At the beginning of the twentieth century, the Morning and Gold Hunter mills were the only concentrators operating in the vicinity of Mullan. The Gold Hunter, being upstream of the Morning Mill, received clear water at the mill's intake while it was reported that water received by the Morning Mill was opaque with slimes discharged by the Gold Hunter Mill. As early as 1901, mining companies began to respond to complaints about the discharge of tailings to the river. Although no efforts were made to contain tailings above the confluence with Canyon Creek, mining companies in the Upper South Fork did contribute to the construction and maintenance of tailings impoundments at Osburn and Pine Creek (Quivik 1999).

By 1909, companies were already erecting mills to reprocess tailings deposited in the Upper South Fork. The Northern Idaho Metals Company reportedly impounded an estimated 10,000 tons of tailings in its settling pond during the summer of 1917 at a location midway between Wallace and Mullan. This material contained approximately 5.5 percent lead, 5.5 percent zinc, and 2 oz of silver per ton. In 1917, the company shipped retreated tailings concentrates worth $40,000 (Quivik 1999).

Production records for the Upper South Fork Watershed indicate that an estimated 24 million tons of ore were mined in the area from 1895 to 1990 (Mitchell and Bennett 1983; SAIC 1993). This included an estimated 1.7 million tons of lead, 0.8 million tons of zinc, 0.4 million tons of copper, 5,000 tons of silver and 1.4 tons of gold. Tailings production for the watershed has been estimated at nearly 20 million tons (SAIC 1993). In decreasing order, the largest producing mines were the Morning-Star, Lucky Friday, Gold Hunter, Snowstorm, and National (SAIC 1993).

The following sections provide historical details of the mining history of the Upper South Fork Watershed and information for specific mines and mills that operated within this area.

2.1.6.1 Mines

The mines that operated in the Upper South Fork Watershed for which ore production was recorded are listed in Table 2.1-1. This table includes the production years of the mine, estimated volumes of ore and tailings produced as a result of the mining activity and the segment in which the mine is (or was) located. Only mines with documented ore production are listed.

2.1.6.2 Mills

Table 2.1-2 lists the mills with operations in the Upper South Fork Watershed for which there are available records. This table includes the operating years of the mill and a summary of ownership, and the segment in which the mill is located.

2.1.7 Mine Workings

Underground workings in many mines are very extensive and act as collection and distribution systems for groundwater. Individual mine workings in this watershed are typically located within a single, relatively steep ridge. Recharging water infiltrates at the highest levels of a mountain ridge and discharges on the same ridge. This is referred to as a local flow system, characterized by short groundwater flow paths (a flow path is the route by which the water enters and exits the groundwater system) (Toth 1963).

Many adits and tunnels in this watershed act as discharge points for groundwater. Typically, adit drainage discharges directly to surface water or first infiltrates waste rock piles before discharging to surface water from seeps. Approximately 153 adits are present in the Upper South Fork Watershed, and 25 of these adits are known to discharge mine drainage (Ridolfi 1999).

2.2 HYDROGEOLOGY

2.2.1 Conceptual Hydrogeologic Model

The Upper South Fork Coeur d'Alene River (Upper South Fork) Watershed is an aggraded, alluvial valley which occupies approximately 50 square miles and is fed by numerous tributary streams (Part 1, Figure 1.2-2). Elevations in the watershed range from 2,700 feet above msl along the South Fork at Wallace to 6,400 feet msl at the headwaters of the South Fork near Mullan Pass and at tributary streams in the eastern portion of the watershed (Part 1, Figure 1.2-2).

The groundwater system consists of unconsolidated sediments overlying less permeable rocks of the Belt Supergroup (Belt). This system occurs primarily in an elongate trough along the South Fork, and varies in shape between V-shaped (e.g., as occurs between Wallace and Mullan) to U-shaped (e.g., as occurs in the vicinity of Mullan). The width of the trough is as narrow as about 200 feet between Wallace and Mullan, and is as wide as approximately 1,200 feet in the vicinity of Mullan.

Faulting and fracturing by natural tectonic processes, and human activity (e.g., see mine workings discussion in Section 2.1.7) have increased the otherwise low permeability in the Belt rocks in some areas. The unconsolidated sediments overlying the Belt rocks are the principal hydrostratigraphic unit in the Upper South Fork Watershed. The conceptual hydrogeologic model for the watershed assumes that a single unconfined aquifer is present in the unconsolidated sediments.

Very little specific hydrogeologic data are available for the Upper South Fork Watershed. Near Wallace, the alluvium consists of "sand and gravel with a considerable percentage (10 to 20 percent) of rounded to subrounded cobbles and boulders"(Norbeck 1974). The alluvium is approximately 30 feet thick near Wallace (Norbeck 1974). In general, moving eastward up the South Fork, sediments become increasingly coarser-grained with less silt (Norbeck 1974).

Groundwater levels in wells completed in unconfined aquifers west of the Upper South Fork Watershed (e.g., in the Kellogg and Smelterville areas, and in the lower Canyon Creek Watershed) fluctuate seasonally (Part 1, Figure 1.2-2). Levels are generally highest in the spring and lowest during winter and early spring when precipitation rates are lowest and snowmelt is not occurring. (MFG 1992; MFG 1998). It is assumed that similar groundwater fluctuations occur in the unconfined aquifer in the Upper South Fork Watershed.

2.2.2 Aquifer Parameters

Aquifer parameters are not available from the Upper South Fork Watershed for the presumed single unconfined aquifer in the unconsolidated sediments overlying bedrock. However, based on reported lithologic similarities between the presumed single unconfined aquifer and the upper aquifer of the Smelterville Flats-Bunker Hill aquifer system, it is reasonable to expect that aquifer parameters presented in Table 2.2-1 are similar to the presumed single unconfined aquifer of the Upper South Fork Watershed.

The range of horizontal hydraulic conductivities presented in Table 2.2-1 are typical of clean sand and gravels (Freeze and Cherry 1979). Due to the high degree of variability in available aquifer parameter data, site-specific data will be gathered if necessary to support the design of cleanup alternatives.

2.2.3 Flow Rates and Directions

Groundwater flow direction in the unconsolidated valley-fill deposits is assumed to be generally from east to west with minor north and south components near the mouths of tributary watersheds. There is very little groundwater data available for the Upper South Fork Watershed and this assumption is based on topographic consideration and conditions encountered in other watersheds in the basin.

2.2.4 Surface Water/Groundwater Interaction

Previous studies (MFG 1992; Williams 1989) have reported that the South Fork has both gaining reaches (where groundwater flows into the river) and losing reaches (where surface water flows into the single unconfined aquifer east of Kellogg). The prevailing conceptual hydrologic model holds that the distribution of gaining and losing reaches on the South Fork is governed by the cross-sectional area of the valley-fill deposits. Specifically, where the valley-fill is narrow and/or thin (i.e., constricted valley) net gain to the river from the shallow aquifer is observed; and where the valley fill is wide and/or thick (e.g., at Mullan) net loss from the river to the shallow aquifer is observed. Just as surface (river) water can act as a pathway to the shallow aquifer, this aquifer can recharge surface water at downgradient locations.

It is reasonable to expect that areal limits and net flow rates of gaining and losing reaches on the South Fork will vary from season to season and year to year as a result of variations in recharge-discharge conditions. Currently, mass load measurements are too sparse to indicate potential reaches of gain or loss.

2.2.5 Water Quality and Water Chemistry

Water quality parameters (temperature, pH, specific conductance, salinity, turbidity, and oxidation-reduction [redox] potential) and water chemistry data (e.g., chloride, sulfates, and sulfides) are discussed further in Section 4, Nature and Extent of Contamination, and in Section 5, Fate and Transport.

2.2.6 Groundwater Use

Groundwater use by humans in the Upper South Fork watershed is extremely limited. The majority of the population living in the Upper South Fork Watershed does not use groundwater as a drinking water source. The municipal water supplier in this area is the East Shoshone County Water District that serves the towns of Mullan and Burke. The source of East Shoshone's municipal water is all surface water. Some individual residences not connected to the municipal water system are likely on private wells. Information on the number and location of private wells is not available. In the Drinking Water sections of Part 2 of the Feasibility Study, the number of private, unregulated water sources in Canyon Creek, Ninemile Creek, and Mullan was estimated to be 178; many of these sources are likely to be surface water. The Feasibility Study estimated that five (3 percent) of the unregulated sources in this area might be private wells requiring abandonment because of exceedences over MCLs. The number of wells potentially requiring abandonment is based on percent exceedences in previous tap water sampling events throughout the entire Basin.

The Human Health Risk Assessment (Terragraphics 2000), evaluated shallow groundwater sampled from monitoring wells near chemical source areas in Ninemile and Canyon Creeks. This shallow groundwater could not be used as a drinking water source because of the high concentrations of metals in the water.

2.3 SURFACE WATER HYDROLOGY

The following sections describe the surface water hydrology of the Upper South Fork. The Upper South Fork Watershed has a drainage area of approximately 50 square miles with approximately 13.3 miles of mapped channel length, and a drainage density of 0.3 miles per square mile.

2.3.1 Available Information

The available hydrologic information for the Upper South Fork includes U.S. Geological Survey (USGS) stream flow data for the Upper South Fork near Mullan, for water year 1999, climatological data for Wallace, ID, and instantaneous discharge data obtained during water quality sampling by a variety of consultants between 1991 and 1999. In addition, historic USGS discharge data is available for several other gages in the area from which historic discharge estimates can be made.

The USGS began reporting stream flow discharge data from Station Number 12413040, South Fork Coeur d'Alene River above Deadmans Creek near Mullan, ID, on October 1, 1998 (USGS 2000). This station records water stage at 15-minute intervals. Discharge is calculated from the stage data based on a rating curve developed for the specific gage. The rating curve is developed through time by measuring discharge at known stages to relate stage to discharge. Once a rating curve is developed, a discharge can be calculated by comparing a known stage to the rating curve. One complete year of discharge data, water year 1999, is available for the South Fork at Mullan at this time. Water year 1999 ran from October 1, 1998 to September 30, 1999. Precipitation data from the Western Regional Climate Center (WRCC) station at Wallace, Woodland Park were collected for the same period (WRCC 2000). This precipitation gage is the nearest gage to the Upper South Fork. The mean daily discharge hydrograph and precipitation data are presented in Figure 2.3.1-1. The maximum discharge recorded during water year 1999 was 466 cubic feet per second (cfs), on May 26, 1999. The minimum recorded discharge for this period of record was 9.2 cfs.

In addition to the USGS gage on the Upper South Fork, the USGS has several gages in the area with historical stream flow data, most notably USGS station number 12413140, Placer Creek at Wallace, ID and USGS Station number 12413150, the South Fork at Silverton. The Placer Creek gage has a drainage area of 14.9 square miles and a period of record from November 1967 to September 1995, October 1996 to September 1997, and water year 1999. The South Fork at Silverton has a drainage area of 108 square miles and period of record from November 9, 1967, to September 30, 1988, and water year 1999 (USGS 2000). These data and other estimates of discharge from other tributaries can be used to estimate historical hydrographs of the Upper South Fork at Wallace.

Stream discharge measurements were taken in association with water quality sampling events completed by McCulley, Frick & Gilman, Inc. (MFG), URS, Idaho Division of Environmental Quality (IDEQ), and USGS. These measurements have occurred since 1991. These data can be used to evaluate the adequacy of the historical hydrographs developed from the Placer Creek data. These data are summarized in Table 2.3.1-1.

In addition to the USGS hydrologic information, the U.S. Department of Housing and Urban Development, Federal Insurance Administration completed a flood insurance study for the City of Wallace, Idaho (FIA 1979). Peak discharges were computed for 10-year (2,190 cfs), 50-year (3,475 cfs), 100-year (4,535 cfs) and 500-year (6,695 cfs) events for the South Fork upstream of the Canyon Creek confluence. Although these values reported might be dated and coefficients used to calculate these discharges may contain some error, they do provide some basis for selecting a design discharge for remedial actions. The bankful discharge, the approximately 1.5 year event, is estimated to be approximately 1,200 cfs.

2.3.2 Hydrologic Description

The hydrology of the Upper South Fork based on water year 1999 stream discharge, precipitation data, and estimates of historical discharge based on other USGS discharge data and estimates of historical discharge are presented in this section. Base flow discharge is estimated at approximately 30 cfs, maximum discharge is estimated at 2,450 cfs; however, it is likely larger discharges have occurred. This estimate is based on historical discharge data and extrapolation of estimates of discharge from nearby watersheds.

2.3.2.1 Historical Description

Continuous discharge data for the downstream end of the Upper South Fork Watershed are not available; therefore, an estimate of mean daily discharge for the Upper South Fork Watershed was developed from historical data from Placer Creek, the South Fork at Silverton, and estimates of historical discharges in Ninemile and Canyon Creek. The Silverton gage is located downstream of the Upper South Fork Watershed. Between Silverton and the Upper South Fork, three major tributaries enter the South Fork: Canyon, Ninemile, and Placer Creeks. Mean daily discharge estimates for Ninemile and Canyon Creek have been made based on Placer Creek data. These estimates are described in other reports. For the available period of record, an estimate of mean daily discharge of the Upper South Fork was obtained by subtracting the measured discharge from Placer Creek, the estimated discharge from Ninemile and Canyon Creek from the measured discharge at Silverton. This estimate neglects discharge from one other tributary between Silverton and the Upper South Fork, Lake Creek, because gage data are not available. Further, as described in the Canyon and Ninemile Creek reports, the discharge estimates for these two tributaries likely overestimate discharge from these two tributaries from 20 to 45 percent. As such, the estimates for the Upper South Fork are likely underestimated by similar magnitudes. However, these estimates do provide insight to discharges that may be expected in the Upper South Fork Watershed.

The historical estimates of mean daily discharge are presented in Figure 2.3.2-1. The maximum mean daily discharge is estimated at 2,455 cfs and occurred on January 16, 1974. Base flow is estimated to be 30 to 40 cfs. Average annual discharge is estimated at approximately 133 cfs.

2.3.2.2 Flood Frequency

Table 2.3.2-1 presents the estimated discharges for specified flood frequency recurrence intervals for the Upper South Fork. Because historical discharge data are not available for the Upper South Fork, and the estimates of mean daily discharge are already subject to uncertainty, additional manipulation to obtain flood frequency estimates was not completed. Instead, flood frequency developed in the flood insurance study is presented.

2.3.2.3 Water Year 1999

A similar analysis was completed for water year 1999 to estimate mean daily discharge at the Upper South Fork at Wallace as was completed for the historical estimates. The measured discharge at Canyon, Ninemile, and Placer Creeks was subtracted from the measured discharge at Silverton to estimate the mean daily discharge of the Upper South Fork at Wallace for water year 1999. This calculation does not rely on discharge estimates from Ninemile and Canyon as the historic estimates do. These estimates are presented in Figure 2.3.2-2 with the measured precipitation from the Wallace Woodland Park Precipitation gage.

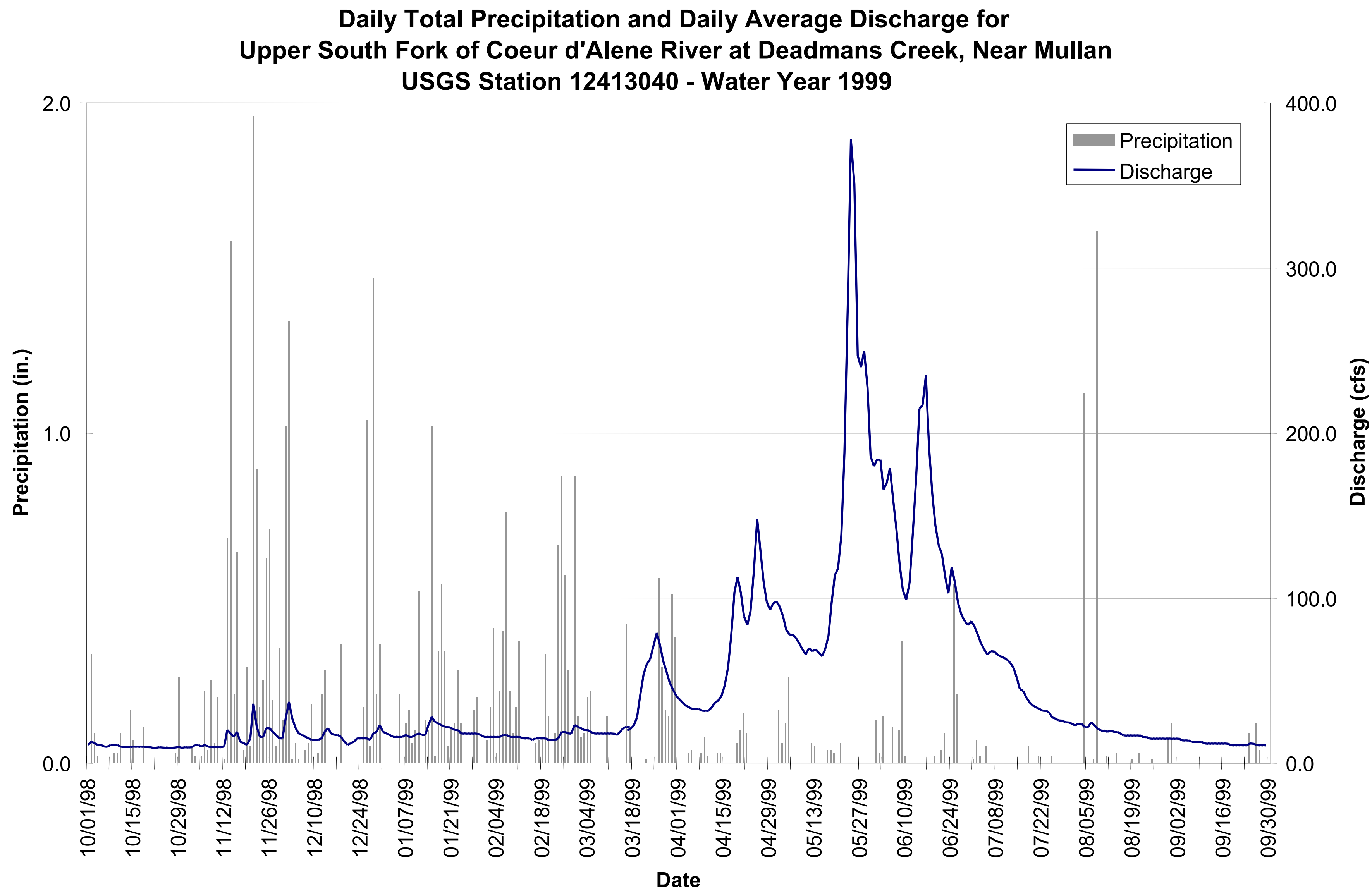
Total annual average precipitation at the WRCC Wallace at Woodland Park Station for the 51-year period of record is 37.7 inches, while for water year 1999 the total precipitation was 39.8 inches (WRCC 2000). Total annual average snowfall for the WRCC station is 83.7 inches while for water year 1999 the total snowfall was 82.2 inches. While these comparisons do not address monthly variations in precipitation, they do indicate that the water budget for water year 1999 was typical.

The mean monthly flows, for the Upper South Fork at Wallace, the Upper South Fork at Mullan, mean monthly precipitation (rain and snow water content), and total snowfall at the WRCC station at Wallace, Woodland Park are summarized in Table 2.3.2-2. Table 2.3.2-2 and Figures 2.3.1-1 and 2.3.2-2 indicate the majority of precipitation, 83 percent, occurred from October to March. Much of this precipitation was in the form of snow and did not runoff into the channel immediately.

As indicated in Table 2.3.2-2, stream discharges remained relatively low through February 1999. Small increases in discharge are noticeable in response to precipitation events, shown in Figures 2.3.1-1 and 2.3.2-2, through the end of March 1999.

The majority of discharge in the Upper South Fork during water year 1999 was produced during spring and summer. The increase in discharge during the spring and summer is attributed to increased runoff caused by snowmelt. Increased discharges began in late March and continued through July 1999. Maximum daily temperature and mean daily discharge for water year 1999 are presented in Figure 2.3.2-3 for the Upper South Fork at Mullan and Figure 2.3.3-4 for the Upper South Fork at Wallace. In both figures, four periods of increases in maximum temperature correspond very well with the increased discharge, March 20 to April 5, April 17 to May 8, May 23 to June 6, and June 11 to July 3. Increased temperatures over these periods melted much of the snow in the upper basin. Rain on snow also contributed to these increased discharges as indicated in Figures 2.3.2-3 and 2.3.2-4.

In summary, water year 1999 was typical from a total snowfall and total water budget perspective in the Upper South Fork Watershed. Runoff from spring snowmelt dominates the surface water hydrology. Variations in snowfall, temperature, and rainfall from year to year will influence the peak discharges.



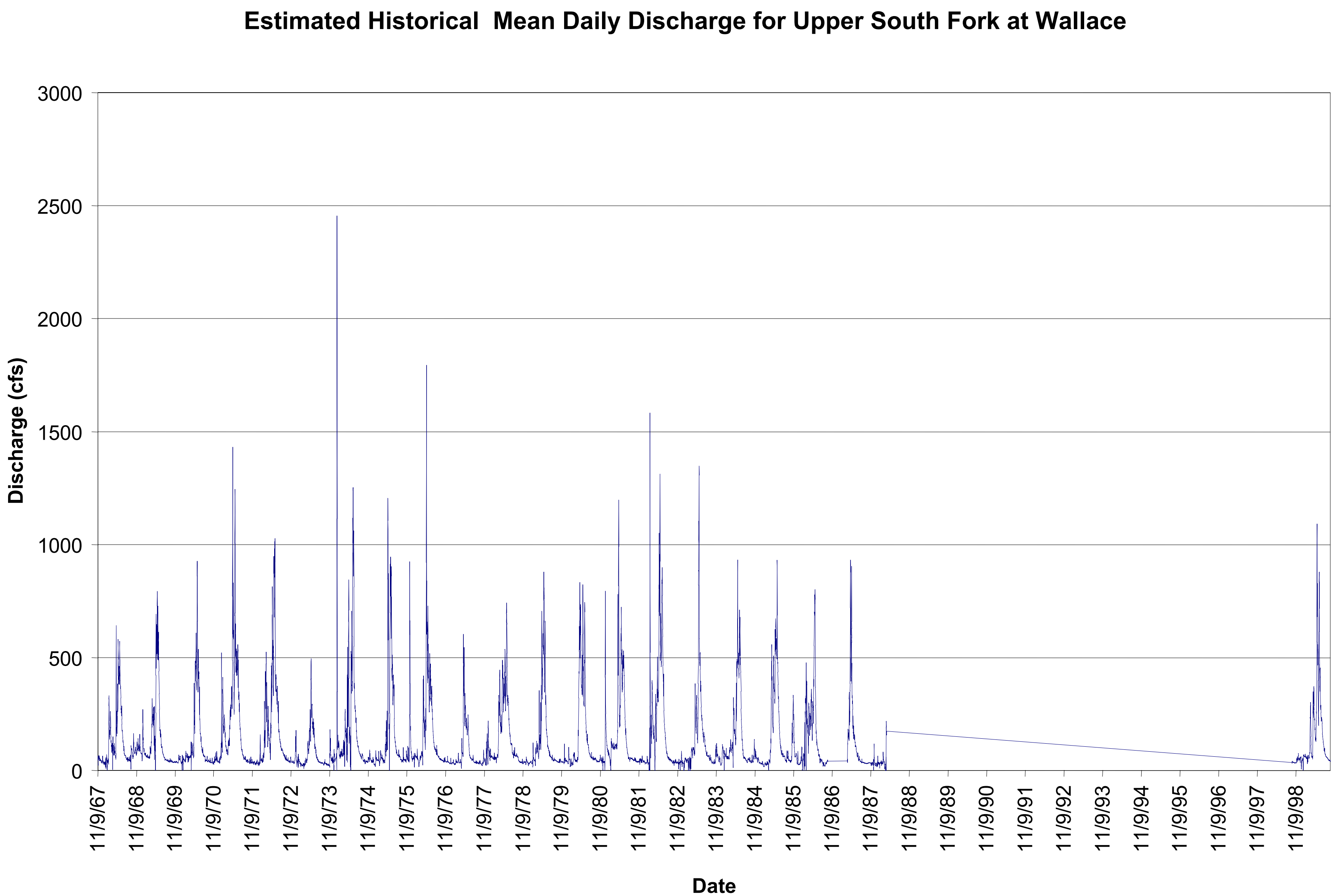
EPA REGION 10

027-RI-CO-102Q
Coeur d'Alene Basin RI/FS
RI REPORT

Doc Control: 4162500.6615.05.a
Generation: 1

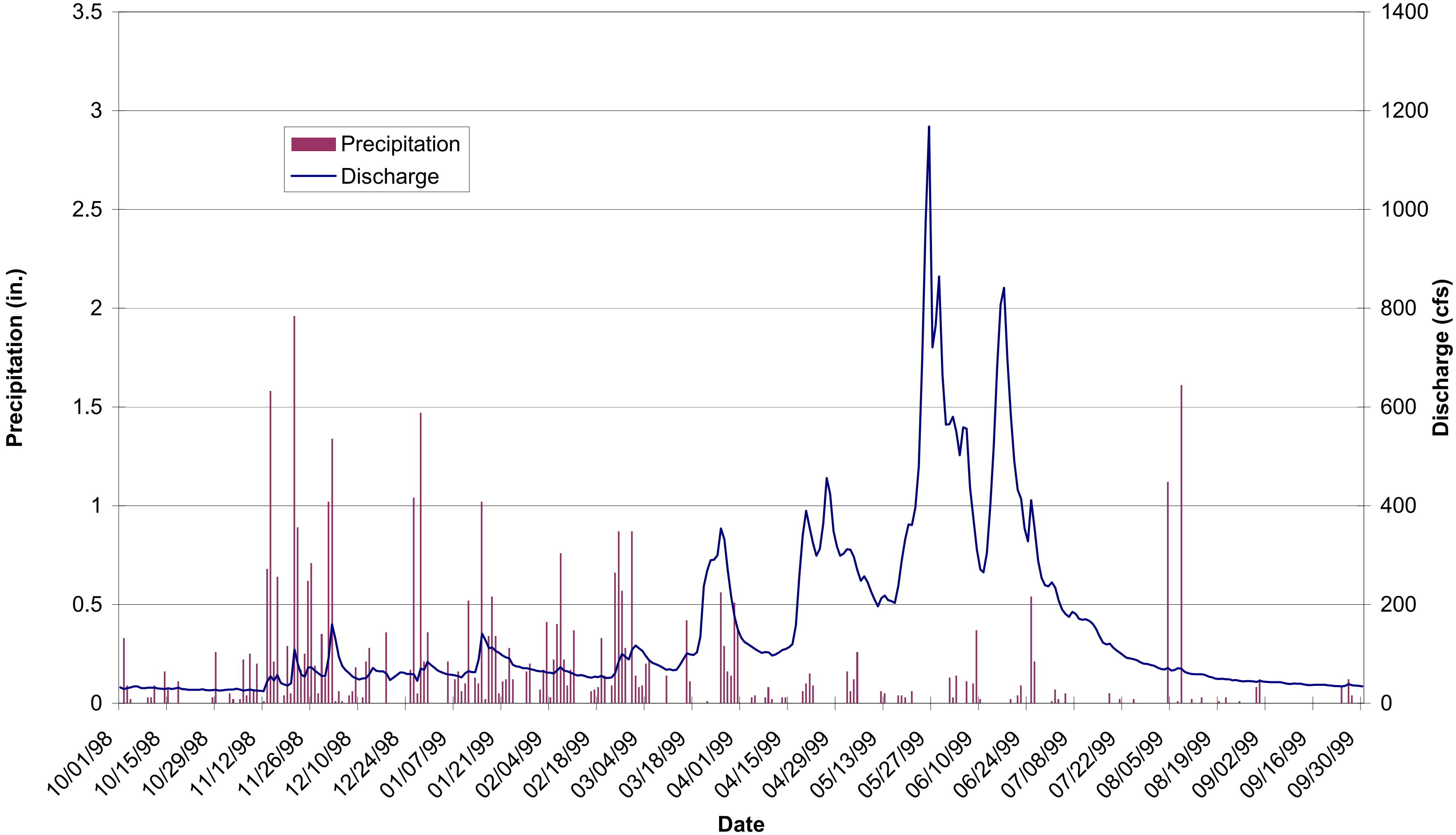
Upper South Fork Series
7/12/01

Figure 2.3.1-1



EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS RI REPORT	Doc Control: 4162500.6615.05.a Generation: 1 Upper South Fork Series 7/12/01	Figure 2.3.2-1

Daily Total Precipitation and Estimated Mean Daily Discharge for South Fork at Wallace, Water Year 1999



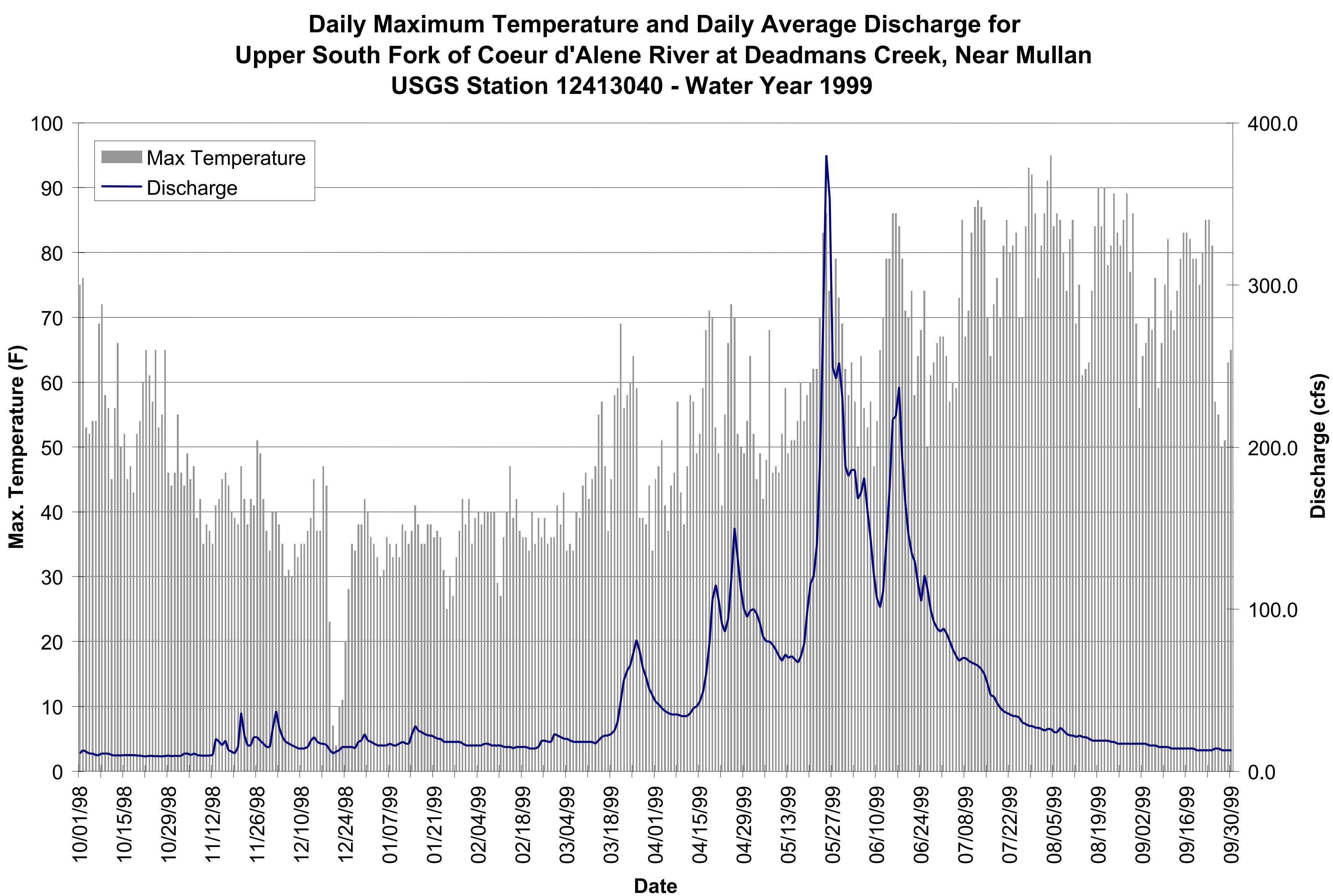
EPA REGION 10

027-RI-CO-102Q
Coeur d'Alene Basin RI/FS
RI REPORT

Doc Control: 4162500.6615.05.a
Generation: 1

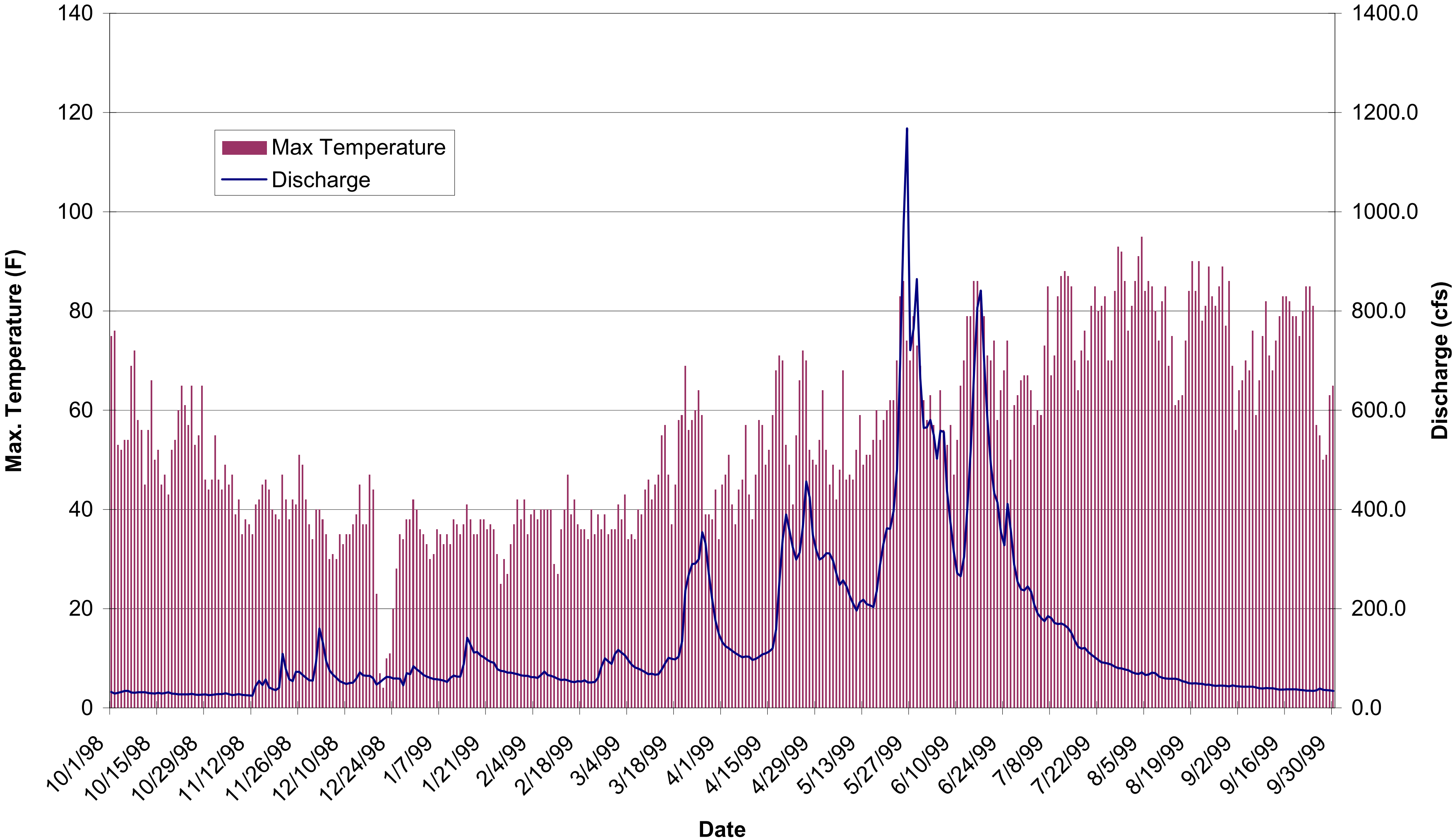
Upper South Fork Series
7/12/01

Figure 2.3.2-2



EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS RI REPORT	Doc Control: 4162500.6615.05.a Generation: 1 Upper South Fork Series 7/12/01	**Figure 2.3.2-3**

Daily Maximum Temperature and Estimated Mean Daily Discharge for Upper South Fork at Wallace, Water Year 1999



EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS RI REPORT	Doc Control: 4162500.6615.05.a Generation: 1 Upper South Fork Series 7/12/01	**Figure 2.3.2-4**

Table 2.1-1
Mines in the Upper South Fork Watershed With Recorded Production

Segment	Production Years	Ore (tons)	Mill	Tailings (tons)	Comments
Alice					
UpperSFSeg01	1909-1926	49,419	Alice	45,861	The Alice Mine was being operated by about the turn of the century. The mine produced several small shipments of ore about this time. In 1908, the Alice Mining Company reported an important discovery of galena at the mine. A mill was built soon after. Prior to that, the mine shipped several small amounts of ore, some of which was milled at the Mammoth Mill. By 1911, the mine was being operated by leasers. The mine was operated by leasers again in 1915 and then apparently closed (Quivik 1999). Equipment for the mill was purchased from the Formosa Mill, which operated for a short time on Canyon Creek (Quivik 1999).
Atlas (Carbonate Hill)					
UpperSFSeg01	1930-1970	6,936	Gold Hunter	6,351	The claims of the Carbonate Hill Mine (later renamed Atlas Mine) were acquired by the Carbonate Hill Mining Company about 1906. By 1918, the mine consisted of approximately 3,000 feet of workings and had been acquired by the Idaho Carbonate Hill Consolidated Mining Company. The Atlas Mining Company acquired the property in 1924. The Hecla Mining Company acquired a 5-year option on the property in 1940, and the Zanetti Brothers also produced ore from the Bird vein during WWII. In 1951, Hecla acquired another option on the property, in association with Newmont Mining Company and the New Jersey Zinc Company. Newmont surrendered its option in 1953 and Hecla and New Jersey Zinc surrendered their options in December 1954 (IGS 1999).
Butte & Coeur d'Alene (Idaho Silver)					
UpperSFSeg01	1926	35		NA	Small producer

Table 2.1-1 (Continued)
Mines in the Upper South Fork Watershed With Recorded Production

Segment	Production Years	Ore (tons)	Mill	Tailings (tons)	Comments
Golconda					
UpperSFSeg01	1926-1967	339,228	Golconda	274,299	The Golconda Lead Mines Company was incorporated in January 1927. The company consolidated the properties of the Hector Mining Company and the Mayflower Mining & Development Company. Prior to construction of the Golconda Mill, ore for concentration were processed at the Hercules custom mill. The mine was closed in March of 1930 due to low metals prices. The mine was reopened sometime during the 1930s and continued to produce ore until its closure in 1945 (Quivik 1999).
Gold Hunter					
UpperSFSeg01	1901-1954	3,260,750	Gold Hunter	3,065,496	The Gold Hunter was one of the first mines in the Coeur d'Alene mining district. The mine was a regular producer during most of the 1890s. Ore from the mine was shipped to the mill by an aerial tramway. About 1900, the mine was producing about 150 tons of ore per day. During the 1920s, the mine was leased to others. The mine was closed in April 1949 (Quivik 1999).
Lucky Friday					
UpperSFSeg01	1938-1990	5,674,668	Lucky Friday, Golconda	4,485,010	J.F. Ingalls and others staked the original claims of the Lucky Friday Mine about 1900. The mine was operated by the Lucky Friday Mines Company from 1906 to 1912 and by the Lucky Friday Mining Company from 1914 to 1926. The mine did not show much promise until 1938, when the mine was leased by John Sekulic. Sekulic organized the Lucky Friday Silver-Lead Mines Company and was able to generate sufficient financial backing for an ambitious development plan. An important discovery of lead-silver ore was made and within three years the mine was paying a dividend. In 1958, Hecla acquired a portion of the Lucky Friday Mine. In 1961, the mine was reported to have reached a depth of 5,000 feet. It continues to operate during the present day (Quivik 1999).

Table 2.1-1 (Continued)
Mines in the Upper South Fork Watershed With Recorded Production

Segment	Production Years	Ore (tons)	Mill	Tailings (tons)	Comments
Morning					
UpperSFSeg01	1895-1952	14,136,333	Morning	11,163,230	The Morning Mine was located some time before 1887. Charles Hussey purchased the mine from its original locators during that year. In November 1891, the Morning Mining Company was formed to acquire the Morning Mine and mill. Due to financial difficulties resulting from Hussey's ownership of the mine, stockholders of the Morning Mining Company reorganized the company as the Morning Mining & Milling Company. The mine and mill were being leased by Thomas Greenough and Peter Larson by late 1895. By about the mid-1890s, the mine had become one of the most important producers of the Coeur d'Alenes. In 1897, Greenough and Larson purchased the mine, mill and associated properties. By this time, the mine was producing about 500 tons of ore per day. In 1905, the mine and mill were sold to the Federal Mining & Smelting Company. In 1917, production at the mine had reached a rate of 1500 tons per day, some of which had to be treated at the Mammoth Mill. Later mine output was returned to 1,000 tons per day when the Star Mining Company brought suit against Federal for operating in Star ground. The mine experienced periods of reduced activity during the 1930s due to the Great Depression. By the late 1930s, production had returned to pre-Depression levels. The Federal Mining & Milling Company merged with ASARCO in 1953. The Morning Mine was closed during October of that year.

Table 2.1-1 (Continued)
Mines in the Upper South Fork Watershed With Recorded Production

Segment	Production Years	Ore (tons)	Mill	Tailings (tons)	Comments
National					
UpperSFSeg01	1914-1922	170,008	National	164,316	An important discovery of copper ore was made a the National Mine (also referred to as the National Copper Mine) in 1913. The discovery was significant enough to justify the construction of a 500-ton flotation plant. In 1918, the National property was the most important producer of copper in Shoshone County. Production at the mine between 1915 and 1918 netted a profit of $59,080. The mine and mill were also operated for several months in 1919. In 1923, the Independent Copper Mining & Milling Company and its successor the Consolidated Independent Calumet Mining Company did some prospecting at the mine. This arrangement continued until 1931 (IGS 1999).
Reindeer Queen					
UpperSFSeg01	1910-1916	147		116	The Reindeer and Copper Queen mines were consolidated in 1913, thus forming the Reindeer Queen Mining Company. Both mines had been extensively developed by as early as 1909. By 1915, the mine consisted of approximately 7,000 feet of workings. Production records indicate that the mine made shipments of copper ore in 1910 and 1916. The mine went idle for the next several years until development work resumed in 1924. After 1928, the company did only assessment work for the next several years and then remained idle thereafter. In the early 1980s, the Anaconda Minerals Co. undertook a deep "wildcat" exploration of the area. Anaconda drilled a 3,500-foot-deep hole at the Reindeer Queen in 1984. This project was later terminated by Anaconda's parent company ARCO (IGS 1999).

Table 2.1-1 (Continued)
Mines in the Upper South Fork Watershed With Recorded Production

Segment	Production Years	Ore (tons)	Mill	Tailings (tons)	Comments
Snowstorm					
UpperSFSeg01	1904-1943	826,580	Snowstorm	706,612	The Snowstorm Mine was producing by 1901. During that year, the mine became the first in the Coeur d'Alenes to ship copper. The ore was shipped to the Tacoma smelter. During the winter of 1904/1905, the mine was shipping as much as 160 tons of first class copper ore per day. J.H. Howard & Company was leasing the upper workings of the mine at this time. Thomas Greenough, one of the owners of the Morning Mining Company, purchased the Snowstorm in mid 1905. J.H. Howard & Company continued to lease the upper workings of the mine while Greenough concentrated on developing the lower workings. The mine produced as much as 500 tons per day of smelting ore in 1909. The mine was closed in 1917 (Quivik 1999).
UpperSFCDRSeg01					
Vindicator	1922-1938	28		NA	Small producer

Notes: Blank cells indicate that there was most likely no mill located on site, and ores were probably shipped elsewhere for milling. No records were found identifying the mill to which the ores were shipped. Estimated tailings produced by each mine were not necessarily disposed of within the reach where the ores were mined.

Source: Stratus 1999, unless otherwise noted.

Table 2.1-2
Mills With Documented Operations in the Upper South Fork Watershed

Segment	Operating Years	Ownership	Comments
Alice			
UpperSFCDRSeg01	1909-1913	Alice Mining Company	The Alice Mining Company reported a rich strike of galena at the Alice Mine in 1908. Prior to that, the mine shipped several small amounts of ore, some of which was milled at the Mammoth Mill. With the 1908 galena strike, the company decided to construct a mill. Equipment for the mill was purchased from the Formosa Mill, which operated for a short time on Canyon Creek. The mill was operating by late 1909 and was closed by July 1910. The mill ran briefly for a period between 1912 and 1913 and was then apparently closed (Quivik 1999).
Golconda			
UpperSFCDRSeg01	1928-1959	Golconda Lead Mines Company	The Golconda Mill was built in 1928 by the newly incorporated Golconda Lead Mines Company. The mill was located on the north bank of the South Fork, below the mouth of Trowbridge Gulch. The mill used selective flotation to treat up to 200 tons of ore per day. Prior to the mills' construction, mine ores had been treated at the Hercules custom mill. In 1929 the mill treated 65,600 tons of ore. Zinc concentrates from the mill were sent to the Anaconda smelter and lead concentrates were sent to East Helena. The mill and mine were closed in March of 1930 due to falling metals prices caused by the Great Depression. The mill apparently reopened during the 1930s and began to serve as a custom mill treating tailings and dump material from the Interstate-Callahan and Amazon-Manhattan properties as well as tailings from Canyon Creek. The mill also continued to treat ore of the Golconda Mine. The capacity of the mill had been increased to 250 tons per day about this time. During the 1940s, the mill was used to treat ore from the Sunshine, Sunset, Lucky Friday and several other mines as well as ore from the Golconda. After closure of the Golconda Mine in 1945, the mill continued to treat ores of other mines and tailings until it was closed in 1959, after construction of the Lucky Friday Mill (Quivik 1999).

Table 2.1-2 (Continued)
Mills With Documented Operations in the Upper South Fork Watershed

Segment	Operating Years	Ownership	Comments
Gold Hunter			
UpperSFCDRSeg01	1889-1949	Gold Hunter Company	Construction of the original Gold Hunter Mill was begun in the fall of 1888. The mill was located at the mouth of Hunter Gulch, about a half mile upstream of Mullan. The mill was designed for a capacity of 150 tons per day. Operation of the mill began the following spring. Ore was shipped to the mill via an aerial tramway from the mine. The mill was destroyed by fire during the summer of 1897. Construction of a new mill was begun late in 1899. The mill began operation in the spring of 1900. At that time, the mill capacity was 300 tons per day, although the mill typically operated at a rate of about 150 tons per day. By 1912, the capacity of the mill had been increased to 400 tons per day. In 1914, the Gold Hunter Company began experimenting with flotation processes at the mill. A Callow flotation plant was installed during November of that year. During the mid 1920s a tailings impoundment was constructed to settle coarse tailings from the mill waste. Finer slimes continued to be dumped in the river. Also about this time, the mill capacity was increased to 500 tons per day. In addition to treating Gold Hunter ore, the mill was also being used for reprocessing of historical tailings waste. The mill was used to treat ore of the Atlas mine beginning in 1930. Later the mill was inactive for some time before it was reopened by lessees in 1935. The mill continued to be operated by lessees through most of the 1940s. The mill was finally closed in October 1949 (Quivik 1999).
Lucky Friday			
UpperSFCDRSeg01	1960-present day	Lucky Friday Silver-Lead Mines Company	The Lucky Friday Mill was built near the portal of the Lucky Friday Mine in 1959. The 350-ton per day mill was operating by February 1960, and capacity was quickly expanded to 700 tons per day. The mill was designed with both lead and zinc circuits, resulting in a cleaner lead concentrate. The mill was reported to be operational in 1999 (Quivik, 1999).

Table 2.1-2 (Continued)
Mills With Documented Operations in the Upper South Fork Watershed

Segment	Operating Years	Ownership	Comments
UpperSFCDRSeg01	1914-1920	National Copper Mining Company	The National Copper Mining Company began construction of a 500-ton mill at the mouth of Deadman Gulch in 1913. Construction of the mill was spurred by an important discovery of copper ore made in the mine. The new mill began operation in April 1914. The mill is said to have been the first copper concentrator to use the Callow pneumatic flotation process. The mill was closed after two months of operation due to a lack of processing ore from the mine. It was reopened in 1915 and operated intermittently until being closed in April 1920. The mill was disassembled soon after (Quivik 1999).
Morning			
UpperSFCDRSeg01	Approxi-mately 1889-1891 1891-1956	Charles Hussey, Morning Mining Company, Federal Mining & Smelting Company, ASARCO	Charles Hussey began construction of the original Morning Mill in 1889. The mill was fed ore by an aerial tramway from the mine and water was supplied by the South Fork via a flume. The mine and mill were acquired by the newly formed Morning Mining Company in November 1891. The Morning Mining Company built a new mill downstream of Hussey's mill in an area that was apparently better situated. The new mill did not operate on a regular basis until about 1895. The mill was leased to the Longmaids and later to Thomas Greenough and Peter Larson, who later purchased the mine and mill in 1897. About this time, the mill was shipping about 2,500 tons of concentrates per month and treating about 500 tons of ore per day. The mill was destroyed by fire in 1898. A new mill with a capacity of 700 tons per day was operating by August of the same year. By 1905, when the mine and mill were purchased by the Federal Mining & Smelting Company, mill capacity had been increased to 1,000 tons per day. The mill became one of the first in the Coeur d'Alenes to experiment with flotation. The mill continued to operate at a rate of 1,000 tons per day until 1921. By 1924, all concentration was being done by selective flotation. Capacity of the mill was 1,200 tons per day. The mill experienced reduced operation during the Great Depression. During WW II the mill was also used to process ore of the Frisco Mine.

Table 2.1-2 (Continued)
Mills With Documented Operations in the Upper South Fork Watershed

Segment	Operating Years	Ownership	Comments
UpperSFCDRSeg01 (Continued)	Approxi-mately 1889-1891 1891-1956	Charles Hussey, Morning Mining Company, Federal Mining & Smelting Company, ASARCO	Operations slowly reduced through the remainder of the 1940s and early 1950s. The mill was apparently closed by ASARCO shortly after the closure of the Frisco Mine in 1956. The mill burned in 1957 and was later dismantled in 1960 (Quivik 1999). The mill was never rebuilt and the Morning Property was leased to Hecla in 1962 (Bull 1999).
Snowstorm			
UpperSFCDRSeg01	1905-1907 1912-1917	J.H. Howard & Company	This first mill associated with the Snowstorm Mine was built about 1904 by J.H. Howard & Company, which was leasing the upper workings of the mine at this time. The leaching plant began operation in 1905 but did not begin operating on a regular basis until 1907. Capacity of the leaching plant was 200 tons per day. It was closed later the same year due to an accident and falling copper prices. In 1912, a new 100-ton mill began to treat ore using conventional gravity concentration. The mill capacity was increased to 200 tons per day later in the same year. The mill operated at full capacity through 1913 and for the first nine months of 1914. The mill operated for a short time in 1917 before it was ultimately closed (Quivik 1999).
Northern Idaho Metals Tailings Retreating			
UpperSFCDRSeg01	1917-unknown	Northern Idaho Metals Company	In the late 1910s, C.L. Hewitt managed the Northern Idaho Metals Company which had a tailings re-treating operation on the South Fork roughly midway between Mullan and Wallace. The Northern Idaho Metals Company established a settling pond near it plant, and in the summer 1917, impounded about 10,000 tons of tailings from the river. The material collected assayed about 5.5 percent lead, 5.5 percent zinc, and 2 oz. silver per ton. The Northern Idaho Metals Company had a flotation plant capable of treating about 90 tons of tailings per day, producing both a lead concentrate and a lead-zinc concentrate. In 1917, Northern Idaho Metals shipped concentrates worth $40,000. It is not known how long its tailings re-treating plant operated (Quivik 1999).

Table 2.2-1
Summary of Aquifer Parameters of the Smelterville Flats-Bunker Hill Upper Aquifer

Hydrostratigraphic Unit	Horizontal Hydraulic Conductivity (ft/day)	Vertical Hydraulic Conductivity (ft/day)	Transmissivity 2 (ft/day)	Storativity (unitless)	Effective Porosity
Upper Aquifer	500 - 10,790	0.0025[a]	10,002-216,852	0.0015-0.09	23.6-29.0

[a]Based on one test conducted on a sample of upper aquifer alluvium from borehole GR-26U at 13.5 feet below ground surface. No units given in original source document.

Source: MFG (1992)

Table 2.3.1-1
Summary of Discharge Data From Project Database
Segment UpperSFCDRSeg01

Segment Name	Site Location	Measured By	No. of Readings	Beginning Date	Ending Date	Minimum Discharge	Maximum Discharge	Units
UpperSFCDRSeg01	SF 10	MFG	1	10/03/91	10/03/91	24.1	24.1	cfs
UpperSFCDRSeg01	SF 201	URS	2	11/11/97	05/09/98	6.11	7.14	cfs
UpperSFCDRSeg01	SF 202	URS, USGS	3	11/11/97	05/22/99	6.41	66.8	cfs
UpperSFCDRSeg01	SF 203	URS	2	11/10/97	05/05/98	0	0	cfs
UpperSFCDRSeg01	SF 204	URS	2	11/10/97	05/09/98	0.533	6.51	cfs
UpperSFCDRSeg01	SF 205	IDEQ, MFG, URS, USGS	48	05/16/91	05/22/99	1.36	146	cfs
UpperSFCDRSeg01	SF 206	URS	2	11/10/97	05/08/98	1.09	4.33	cfs
UpperSFCDRSeg01	SF 207	URS	2	11/10/97	05/08/98	0.936	7.3	cfs
UpperSFCDRSeg01	SF 208	MFG, URS, USGS	19	05/16/91	08/31/99	5	366	cfs
UpperSFCDRSeg01	SF 209	URS	2	11/10/97	05/08/98	1.25	27.2	cfs
UpperSFCDRSeg01	SF 210	URS	2	11/10/97	05/08/98	7.34	80.7	cfs
UpperSFCDRSeg01	SF 211	URS	2	11/09/97	05/08/98	0.134	0.914	cfs
UpperSFCDRSeg01	SF 212	URS	2	11/09/97	05/08/98	0.337	22.9	cfs
UpperSFCDRSeg01	SF 213	URS	2	11/10/97	05/08/98	0.0152	0.027	cfs
UpperSFCDRSeg01	SF 214	URS	2	11/09/97	05/11/98	4.98	81	cfs
UpperSFCDRSeg01	SF 215	MFG, URS	4	05/15/91	05/10/98	17.8	428	cfs
UpperSFCDRSeg01	SF 216	URS	1	11/09/97	11/09/97	2.24	2.24	cfs
UpperSFCDRSeg01	SF 217	URS	2	11/09/97	05/08/98	0	0	cfs
UpperSFCDRSeg01	SF 218	URS	2	11/09/97	05/08/98	0.14	0.401	cfs
UpperSFCDRSeg01	SF 219	URS	2	11/08/97	05/06/98	0.285	0.4	cfs
UpperSFCDRSeg01	SF 220	IDEQ, MFG, URS, USGS	48	05/15/91	05/10/98	16.45	432	cfs
UpperSFCDRSeg01	SF 221	URS	2	11/08/97	05/06/98	2.81	46.8	cfs
UpperSFCDRSeg01	SF 222	URS	2	11/08/97	05/06/98	1.55	30.6	cfs
UpperSFCDRSeg01	SF 223	URS	2	11/08/97	05/06/98	1.47	7.89	cfs
UpperSFCDRSeg01	SF 224	URS	2	11/08/97	05/06/98	0.204	3	cfs
UpperSFCDRSeg01	SF 225	URS	2	11/07/97	05/05/98	1.29	41.4	cfs
UpperSFCDRSeg01	SF 226	URS	2	11/07/97	05/05/98	1	1.2	cfs
UpperSFCDRSeg01	SF 227	MFG, URS, USGS	5	05/15/91	05/24/99	26.6	466	cfs
UpperSFCDRSeg01	SF 228	IDEQ, MFG, URS, USGS	60	05/16/91	12/31/99	22.25	859	cfs
UpperSFCDRSeg01	SF 229	URS	2	11/07/97	05/05/98	0.477	0.6	cfs
UpperSFCDRSeg01	SF 230	URS	2	11/06/97	05/05/98	0.497	12.3	cfs
UpperSFCDRSeg01	SF 231	URS	1	11/06/97	11/06/97	0.067	0.067	cfs
UpperSFCDRSeg01	SF 275	URS	1	05/07/98	05/07/98	8.01	8.01	cfs
UpperSFCDRSeg01	SF 316	URS	1	05/08/98	05/08/98	0.0068	0.0068	cfs
UpperSFCDRSeg01	SF 317	URS	1	05/07/98	05/07/98	0.141	0.141	cfs
UpperSFCDRSeg01	SF 318	URS	1	05/07/98	05/07/98	8.88	8.88	cfs
UpperSFCDRSeg01	SF 319	URS	1	05/07/98	05/07/98	3.9	3.9	cfs
UpperSFCDRSeg01	SF 320	URS	1	05/07/98	05/07/98	0.00675	0.00675	cfs
UpperSFCDRSeg01	SF 321	URS	1	05/07/98	05/07/98	2.42	2.42	cfs
UpperSFCDRSeg01	SF 650	USGS	1	05/24/99	05/24/99	466	466	cfs

Table 2.3.2-1
Estimated Recurrence Intervals, Upper South Fork

Recurrence Interval (Years)	Flood Insurance Study Above Canyon Creek Estimated Peak Flow (cfs)
10	2,190
50	3,475
100	4,535
500	6,695

Note:
cfs - cubic feet per second

Table 2.3.2-2
Precipitation Summary and Discharge Comparison for Water Year 1999,
Wallace Woodland Park, Idaho
NOAA Cooperative Station 109498

Climate Indicators	Monthly Totals												Annual
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Total Precipitaiton (in.)	1.2	9.7	6.9	4.7	6.9	3.5	0.7	0.9	1.8	0.2	3.0	0.3	39.8
Total Snowfall (in.)	0.0	6.3	8.7	18.9	26.4	21.3	0.6	0.0	0.0	0.0	0.0	0.0	82.2
Average Precipitation for Period of Record (in.)	2.9	4.9	5.2	5.0	3.9	3.4	2.8	2.7	2.6	1.3	1.4	1.9	37.7
Average Snowfall for Period of Record (in.)	0.5	8.3	22.6	24.0	15.0	10.5	2.5	0.3	0.0	0.0	0.0	0.0	83.7
Mean Monthly Discharge (cfs) (Upper South Fork Near Mullan)	10.1	14.7	17.6	18.9	16.1	34.9	68.4	137.4	146.5	51.7	20.8	14.3	45.9
Estimated Mean Monthly Discharge (cfs) (Upper South Fork at Wallace)	29.3	45.4	68.5	78.6	65.5	151.1	213.7	412.7	453.5	137.5	55.9	38.3	145.8

Note:
cfs - cubic feet per second

3.0 SEDIMENT TRANSPORT PROCESSES

The physical processes of rain falling on soil, runoff from snowmelt or precipitation, channel bank and bed erosion, or mass movements incorporates sediment into streams of water. Water in streams transports, deposits, and sorts the delivered sediment based on the stream energy, discharge, and size and quantity of sediment.

Sediment transport by streams is a natural process; however, human activities such as mining, logging, road building, urbanization, or land clearing can significantly increase the rate at which sediment transport occurs. For instance, land clearing provides exposed soil and rock that may be subject to erosion. Further, this disturbance may decrease the amount of water storage in the soil, increasing runoff rates and providing additional surface water and energy for sediment transport.

The rate at which sediment passes through a cross section of a stream system is referred to as the sediment yield. For purposes of this report, sediment yield will be referred to in units of tons per square mile per year. This annual sediment yield may be broken down into components that describe the method of transport, suspended load and bed load. Suspended load consists of particles small and light enough to be carried downstream in suspension by shear and eddy forces in the water column. Bed load consists of larger and heavier particles that move downstream by rolling sliding or hopping on the channel bed (Dunne and Leopold 1978).

All sediment motion downstream is dictated by the shear and gravitational forces acting at a given time and place within the channel. For sediment transport purposes, gravitational forces are essentially constant. Shear forces, however are dynamic through space and time and are dependent upon the location, depth of water, and slope of the water surface. Sediment transport occurs at even the smallest of stream channel discharge but the majority of movement occurs during moderate to high discharge when shear forces are greatest (Leopold et. al 1992).

Sediment derived in the Upper South Fork of the Coeur d'Alene River is transported through the system and into the South Fork. Sediment sources in the Upper South Fork are mining waste, rock debris situated adjacent to channels, mobilization of channel bed sediment, bank erosion, and sediment derived from road drainage. In this discussion, the available information, analyses, and likely sediment sources are identified.

3.1 AVAILABLE INFORMATION

Sediment transport data are not available for the Upper South Fork. One year of sediment transport gaging data is available for Canyon and Ninemile Creeks, drainages of similar size that are located near the Upper South Fork. In addition, the Upper South Fork has similar topography and land use practices as Canyon and Ninemile Creeks. Therefore, the sediment data from Canyon and Ninemile Creeks may be used to provide useful insight into the likely magnitude of sediment transport from the Upper South Fork.

In addition to the sediment gaging data for Canyon and Ninemile Creeks, historical and current aerial photographs are available. For the Upper South Fork, 1998 photographs by URS Greiner, Inc. (URSG and CH2M HILL 1999), 1991 photographs by U.S. Department of Agriculture (USDA) (USDA 1991), and 1984 photographs by USDA (USDA 1984) were reviewed.

3.2 ANALYSES

3.2.1 USGS Sediment Gaging Data

Because no sediment transport data were collected for the Upper South Fork, estimates of sediment transport for 1999 were made using the sediment transport analysis from Canyon and Ninemile Creeks. The USGS sediment transport data for Canyon and Ninemile Creeks were analyzed in general accordance with the Army Corps of Engineers Engineering Manual EM 1110-2-4000. These analyses are presented in the Canyon and Ninemile reports.

These analyses produced annual sediment yields for Canyon and Ninemile Creeks for three size classes of particles, fines, sand, and bedload, expressed as tons per square mile of drainage area. As land use in these watersheds is similar to the land use in the Upper South Fork, these sediment yields were used to estimate sediment yield in the Upper South Fork. The sediment yield per drainage area was averaged for each size class and applied to the Upper South Fork to estimate an annual sediment yield. The results are presented in Table 3.2-1.

This simplistic analysis only provides guidance to approximate quantities of sediment transported by the Upper South Fork in water year 1999 based on the watershed size and estimates of sediment transport from watersheds with similar land use. Sediment yields can vary significantly from year to year and basin to basin based on hydrologic conditions, sediment inputs, changing land use, and other conditions. There have been remedial actions in both Canyon and Ninemile

Creeks that may alter sediment transport. The sediment yields developed after the Upper South Fork watershed should be considered as very general estimates.

3.2.2 Channel Classification

Channel classifications may provide a level of understanding and description of a channel's behavior. Some channel classification systems require fieldwork and in depth study while others only require topographic map and aerial photograph interpretation. The level of information provided by a classification based solely on topographic map and aerial photograph interpretation is limited but does provide a basic framework for channel processes and conditions. Channel classifications, slopes, and profiles are shown in Figure 3.2-1 through 3.2-3.

Rosgen (Rosgen and Silvey 1996) proposed a classification that delineates channel types based on plan-view morphology, cross-section morphology, channel sinuosity, channel slope, and bed features to provide a broad level delineation. Aerial photograph and topographic map interpretation can be used for this type of classification, Level 1. The Rosgen methodology builds from this broad classification when combined with more detailed information. The Rosgen Level 1 classification was used for this study to identify broad reach-level channel morphologies.

Additional information on stream channel classifications available from the Idaho Division of Environmental Quality's Beneficial Use Reconnaissance Project (IDEQ/BURP) was also reviewed. IDEQ/BURP information is based on field surveys and offer greater resolution, for the limited areas surveyed, than available topographic maps and aerial photographs. IDEQ/BURP channel classifications are shown in Figure 3.2-1.

Electronic USGS 7 ½ minute quadrangle maps containing three-dimensional topographic data were analyzed using AutoCAD Land development software. Plots of channel profile and slope were produced for the Upper South Fork Watershed (Figure 3.2-3). In general, the divisions between segments were established based on changes in channel type or other morphologic feature, as such, each segment contains one or two channel types. However, the Upper South Fork watershed was only divided into one segment, as a result the Upper South Fork contains several channel types. The channel type was determined based on channel slope and observation of aerial photographs from 1998.

Channel stationing was established from the confluence of the Upper South Fork with Canyon Creek as 100-foot stations upstream from the confluence for ease of locating specific features.

This stationing is indicated on Figures 3.2-1 through 3.2-3. This stationing is approximate and is intended for general locating of discussed areas, more detailed stationing and survey should be used for precise locating, and project construction.

In the Upper South Fork Watershed, four Rosgen stream types occur, "Aa+", "A", "B", and "C". The following paragraphs briefly summarize these four types of channel and the mapping effort of channel classification.

"Aa+" streams are very steep, greater than 10 percent, well entrenched, and laterally confined. Sediment supply is often high due to the high energy, steep channel slopes and narrow channel cross sections. Bedforms associated with this channel type include waterfalls, cascades, and step-pools. Debris flows often initiate in "Aa+" type channels. Structural control from joints, faults, or bedding may influence the locations of "Aa+" type channels.

"A" stream types are similar to "Aa+" in that similar bedforms and channel characteristics are common to both types; however, "A" stream types have slopes which range from 4 to 10 percent. Generally, "A" stream types have high sediment transport potential with little in channel sediment storage capacity due to the channel slope. Large woody debris can play a major role in the bedform and channel stability in "A" type streams.

"B" stream types are moderately steep to gently sloped channels, 2 to 4 percent. Faults, joints, contacts often influence "B" type channels by restricting the development of wide floodplains. Stream erosion rates, aggregation and degradation rates are generally low. Lateral movement of "B" type channels is typically low. Rapids and scour pools are typical bed forms in type "B" channels.

"C" stream types generally are located in valleys constructed from alluvial deposition, with well-developed floodplains with slopes generally less than 2 percent. Primary morphologic features of the "C" stream type are the sinuous low relief channel, and the well-developed floodplain built of sediment derived from the river. Lateral migration, aggregation and degradation rates in "C" type channels are dependent on the stability of the banks, discharge and sediment supply from upstream. "C" type channels may be significantly altered by changes in bank stability, discharge, or sediment supply.

The channel types within the Upper South Fork are identified on the topographic maps, Figures 3.2-1 and 3.2-2. The steep channels at the headwaters of the Upper South Fork contain "Aa+" channel types. These steep channels grade through type "A" and "B" channels to "C" channels at approximately station 627+00. The remainder of the Upper South Fork, from station 0+00 to 627+00, contains type "C" channels. However, based on aerial photograph interpretation, much of the channel is constrained in position by roads and dikes making lateral migration unlikely.

IDEQ developed a Rosgen classification for a 120-meter reach of the Upper South Fork, approximately 0.5 miles west of Shoshone Park under the BURP project (see Figures 3.2-1 and 3.2-3). This reach was selected to be representative of general conditions in that area of the watershed. This reach was classified as Rosgen type B in the BURP study (IDEQ 1998, 1999). The differences between the classifications are likely due to differences in the methods used to classify the channel. The classification presented in this study is based on maps, elevation profiles derived using a GIS-based analysis, and aerial photographs. The BURP study relied primarily on field observations and channel measurements. Both classifications are preliminary in nature and are presented here for baseline characterization purposes only. They are not intended for use in the design phase of remediation planning. Detailed, site-specific hydrologic studies may be needed to guide actual remedial design development.

3.2.3 Channel Descriptions

The 1998 set of aerial photographs by URS Greiner, Inc. (URSG) and CH2M HILL, the 1991 and 1984 set by USDA, and the topographic maps and profiles presented in Figures 3.2-1 and 3.2-2 were reviewed to further describe the Upper South Fork. This review and interpretation focused on morphologic features indicating stream instability, channel migration, channel aggregation or degradation and other features that may contribute sediment to the system. These features are mapped on Figures 3.2-1 and 3.2-2. The following paragraphs provide further description.

The Upper South Fork contains one segment, UpperSFCDRSeg01. It has approximately 70,000 feet, or 13.3 miles, of channel as indicated on Figure 3.2-1. Channel slope varies from less than 1 percent at the downstream portions to over 15 percent at the headwaters.

From station 0+00 to 57+00, the channel slope is 0.5 to 1 percent and the channel appears to be channelized and confined in position by I-90 and secondary road embankments. The total valley width is approximately 200 feet. The channel is in the same general location in the 1991 and 1984 photographs. Vegetation is sparse on the channel banks. An exposed cut in the hillslope in the north valley wall from approximate station 8+00 to 15+00 is apparent in all three years of photographs reviewed. Because the channel is constrained and few sediment sources exist within this reach, the only likely sediment sources are channel bed remobilization, minor bank erosion, and runoff from the I-90 embankment.

The Upper South Fork from station 57+00 to 95+00 has a channel slope of 1 to 2 percent and is constrained in location by embankments from I-90 and secondary roads. The banks are moderately vegetated with conifers. The photos reviewed indicate the channel has been in the same general location since 1984. An exposed cut in the north valley wall above the channel exists from approximately station 88+00 to 93+00. As in the lower reaches, the only likely sediment sources in this reach are channel bed remobilization, minor bank erosion, and runoff from the I-90 embankment.

From station 95+00 to 125+00, the channel alignment moves away from the roadway embankments; however, the channel still appears channelized and constrained. Through this reach, the channel flows adjacent to the Mary D Claim workings, Golconda Tailing and Golconda Mine and Millsite with exposed sediment surrounding these areas. Vegetation on the channel banks has become larger and better established since the 1984 and 1991 photographs were taken. Because the channel appears to be constrained, lateral migration is unlikely; as such, likely sediment sources in this reach are remobilization of channel bed material and minor bank erosion. Sediment could be contributed from the mine and mine workings if surface water drainage from these deposits flows into the Upper South Fork; however, from review of the photographs, no channels are obvious.

The Upper South Fork from station 125+00 to 150+00 has a slope of approximately 1 percent and is constrained to a valley approximately 400 feet wide. A high floodplain is situated between the channel and I-90 embankment. The channel has been in the same general location since 1984 based on the photographs reviewed. Vegetation along the channel banks has become better established through time. Sediment sources in this reach are likely channel bed remobilization and minor bank erosion with some potential for erosion into the floodplain deposits between the channel and I-90.

From station 150+00 to 282+00, the Upper South Fork is confined in its location by steep hillslopes, and the I-90 and other roadway embankments. Some areas of channel bank are moderately well vegetated with conifers while other areas have no vegetation apparent. Due to the confined nature of this reach, likely sediment sources are remobilization of channel bed material and minor bank erosion.

The Upper South Fork from station 282+00 to 400+00 flows through the town of Mullan with a slope of approximately 1 percent. The channel location appears to be in the same location in the 1984 and 1991 photographs. The alignment of the channel is situated adjacent to the mill, mine, and tailings dams from the Lucky Friday Mine among others; however, surface drainage is not visible in the photographs reviewed. Likely sediment sources in this reach are remobilization of channel bed material and minor bank erosion. Sediment from the exposed areas around the mines, mills, and tailings dams could also enter the Upper South Fork, if surface water drainage from these sites flows into the Upper South Fork.

From station 400+00 to 447+00, the channel slope appears to increase from 1 to 5 percent. Well vegetated channel banks obscure the channel from direct observation in the photographs reviewed. It appears the channel is constrained in location by embankments from secondary roadways. Likely sediment sources in this reach include minor bank erosion and channel bed remobilization.

The Upper South Fork from station 447+00 to 475+00 is confined in location by road embankments and a Lucky Friday Tailings Pond, with a slope of approximately 1 percent. The banks of the channel are moderately well vegetated. The channel location has been in the same location in the photographs from 1984, 1991, and 1998. Sediment sources in this reach include minor bank erosion and channel bed remobilization. If surface water drainage from the tailings pond is connected to the Upper South Fork, it also may be a sediment source; however, evidence of a connection was not observed in the photographs reviewed.

From station 475+00 to 600+00, the end of photographic coverage, the channel meanders through a valley typically 700 feet wide. Few anthropogenic constraints such as roads exist in this reach of channel. Moderate to heavy vegetation obscures the channel from view over much of this reach. The channel location appears to be in the same general location in the 1984, 1991 and 1998 photographs. Likely sediment sources include minor bank erosion and channel bed remobilization with possible migration of channel location.

3.3 SUMMARY

Based on the information discussed above, approximately 2,400 tons, or about 48 tons per square mile, is estimated to have been transported from the Upper South Fork to the South Fork in 1999. This estimate may be high or may be low, as no sediment transport data are available. Sediment yields vary year to year based on sediment input, hydrologic condition, land use and other factors.

Nevertheless, whatever sediment is generated in the Upper South Fork is transported downstream to the South Fork Watershed. Based on interpretation of aerial photographs from 1984, 1991, and 1998, few point sources for sediment supply to the Upper South Fork exist. Sampling location and source areas are shown in figures in Section 4.1. Lateral migration of the Upper South Fork appears to be unlikely throughout its length based on photographic review. Channelization and embankments provide a stable location for the channel; however, little variability exists in such channels.

These observations were based on a limited review of the available data, photographs, and topographic maps at the time of review. Not all potential sediment sources were identified as potential sediment sources literally cover the entire watershed. Primary sources were identified based on review of the available information.

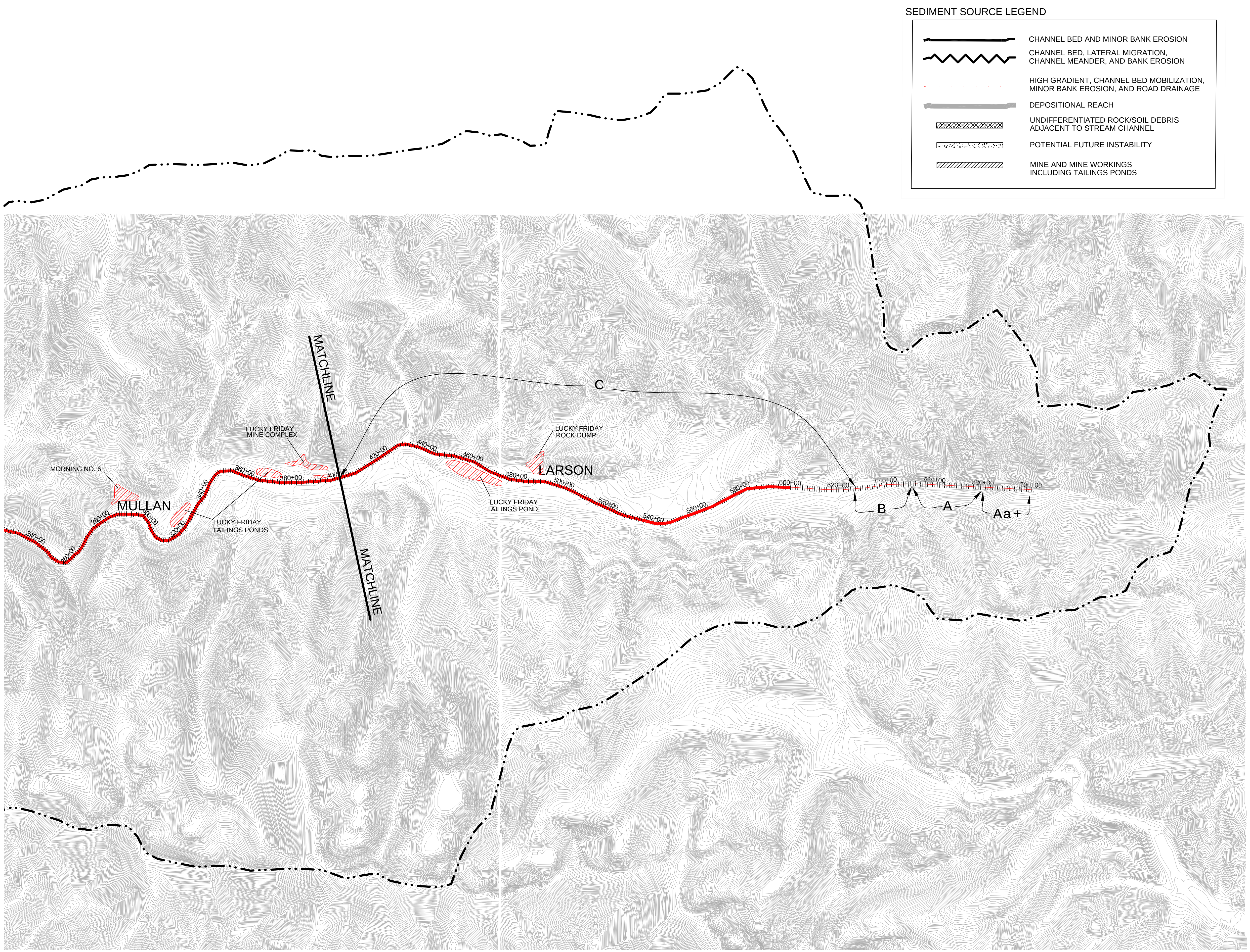
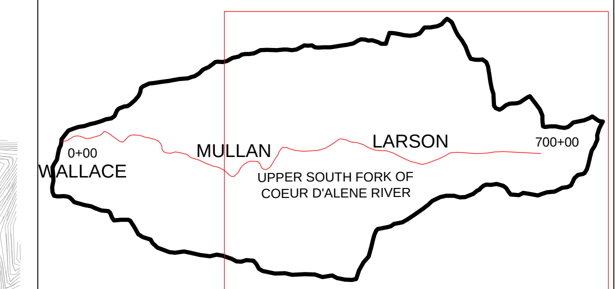


Figure 3.2-1
Upper South Fork Coeur d'Alene River Segment 01 Site Plan East Portion

UPPERSFCDRSEG01



LEGEND

- BASIN BOUNDARY
- CONTOUR LINE
- CHANNEL CENTERLINE
- INTERSTATE/ROAD/TRAIL
- Aa+ ROSGEN CLASSIFICATION

NOTES:

1. MAP FEATURES AND CONTOURS PRODUCED BY AMERICAN DIGITAL CARTOGRAPHY, COPYRIGHT 1995, AND BASED ON 7.5 MINUTE SERIES MAPS, REVISED 1977, ZONE ID-W.
2. VERTICAL DATUM BASED ON NAD83 IDAHO STATE PLANE COORDINATE SYSTEM.
3. CONTOUR INTERVAL IS 25 FEET.
4. CHANNEL CENTERLINE TAKEN AT APPROXIMATE LOW POINT OF STREAM CHANNEL.
5. SEDIMENT SOURCE LOCATIONS ARE APPROXIMATE AND ARE BASED ON TOPOGRAPHIC MAP AND AERIAL PHOTOGRAPH INTERPRETATION.

N W E S

0 4000 8000

Scale in Feet

027-RI-CO-102Q
Coeur d'Alene Basin RI/FS
RI Report

EPA REGION 10

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UPPERSFCDASeg01(2)
08/04/2001

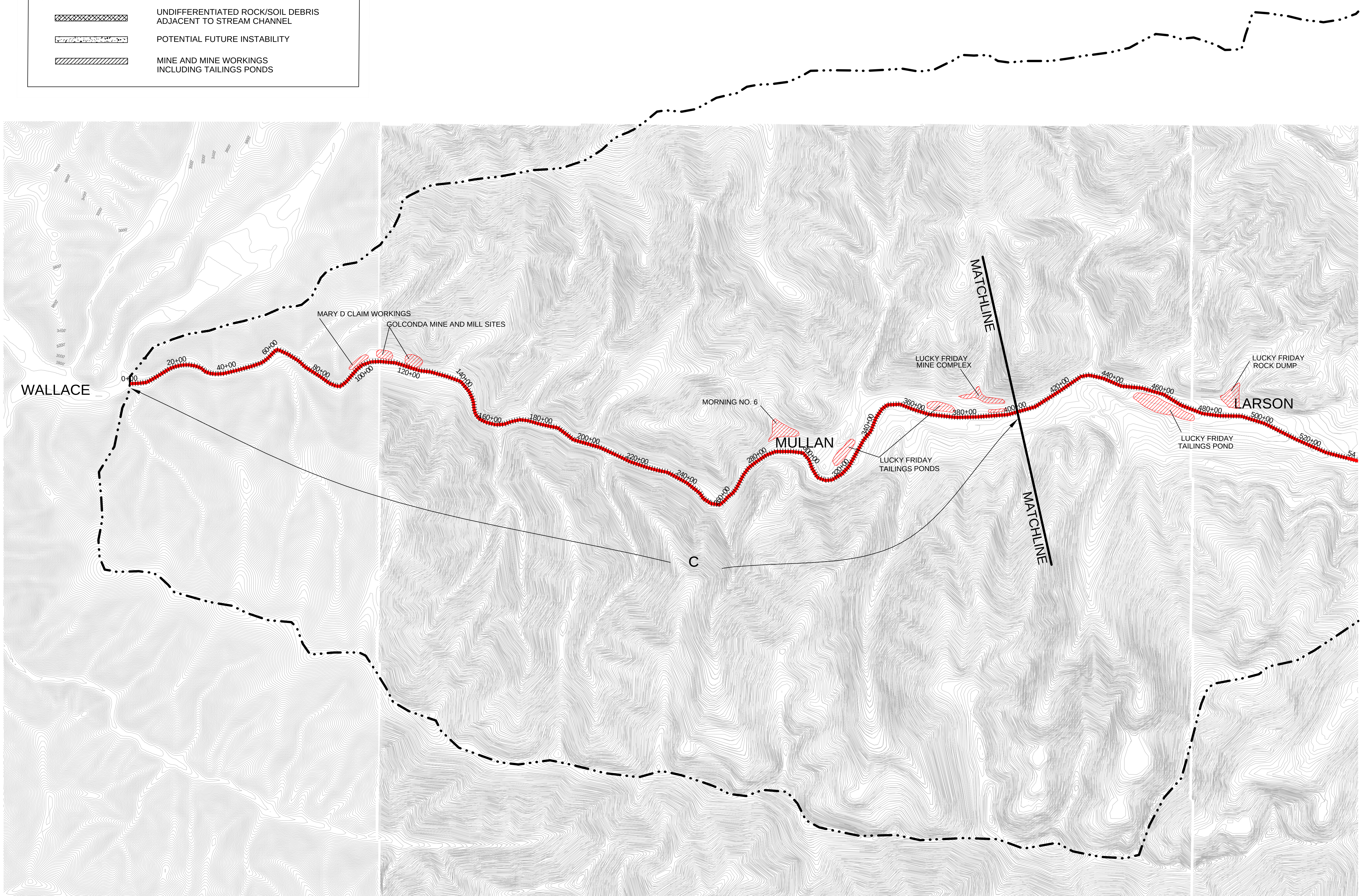
This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: August 5, 2001

Figure 3.2-2
Upper South Fork Coeur d'Alene River
Segment 01 Site Plan
West Portion

SEDIMENT SOURCE LEGEND

- CHANNEL BED AND MINOR BANK EROSION
- CHANNEL BED, LATERAL MIGRATION, CHANNEL MEANDER, AND BANK EROSION
- HIGH GRADIENT, CHANNEL BED MOBILIZATION, MINOR BANK EROSION, AND ROAD DRAINAGE
- DEPOSITIONAL REACH
- UNDIFFERENTIATED ROCK/SOIL DEBRIS ADJACENT TO STREAM CHANNEL
- POTENTIAL FUTURE INSTABILITY
- MINE AND MINE WORKINGS INCLUDING TAILINGS PONDS



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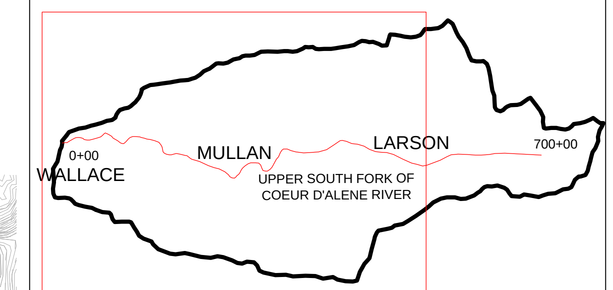

LEGEND

- BASIN BOUNDARY
- CONTOUR LINE
- CHANNEL CENTERLINE
- INTERSTATE/ROAD/TRAIL
- Aa+ ROSGEN CLASSIFICATION

NOTES:

1. MAP FEATURES AND CONTOURS PRODUCED BY AMERICAN DIGITAL CARTOGRAPHY, COPYRIGHT 1995, AND BASED ON 7.5 MINUTE SERIES MAPS, REVISED 1977, ZONE ID-W.
2. VERTICAL DATUM BASED ON NAD83 IDAHO STATE PLANE COORDINATE SYSTEM.
3. CONTOUR INTERVAL IS 25 FEET.
4. CHANNEL CENTERLINE TAKEN AT APPROXIMATE LOW POINT OF STREAM CHANNEL.
5. SEDIMENT SOURCE LOCATIONS ARE APPROXIMATE AND ARE BASED ON TOPOGRAPHIC MAP AND AERIAL PHOTOGRAPH INTERPRETATION.

N W E S

0 4000 8000
Scale in Feet

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Coeur d'Alene Basin RI/FS
RI Report

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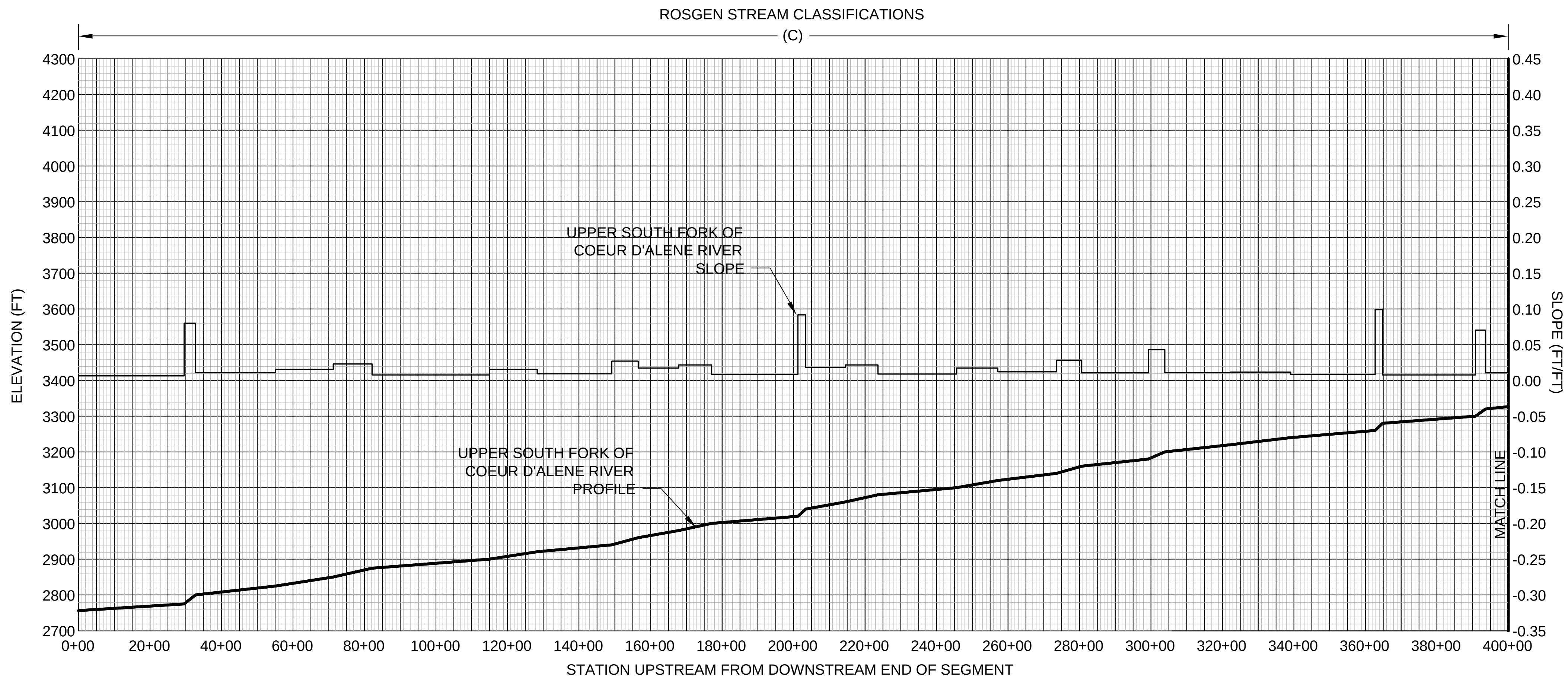
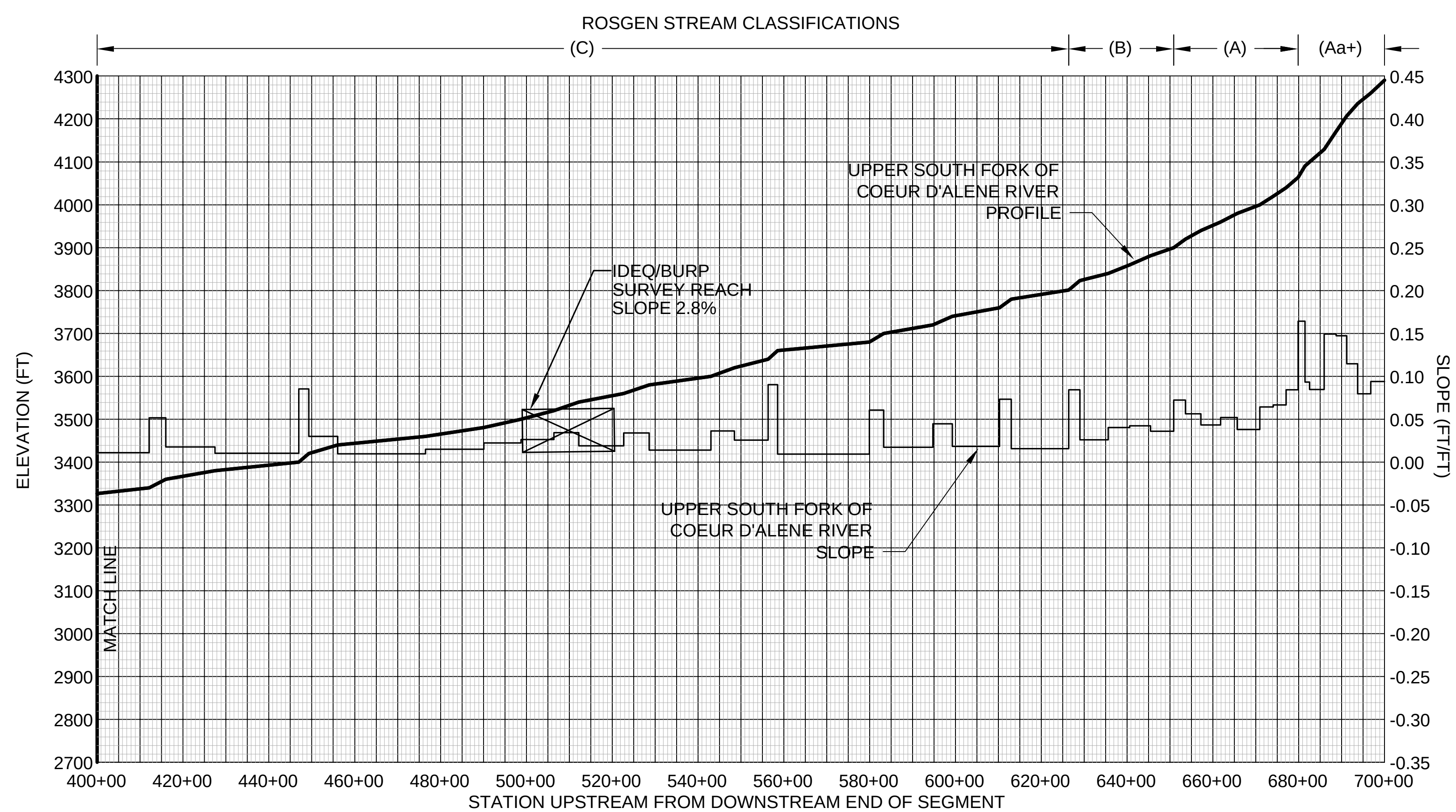
08/05/2001

This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: August 5, 2001

Figure 3.2-3
Upper South Fork Coeur d'Alene River
Segment 01
Rosgen Stream Classification





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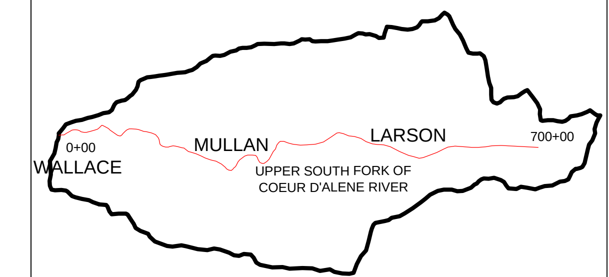

LEGEND

SEGMENT PROFILE

SEGMENT SLOPE

NOTES:

1. CHANNEL PROFILE AND SLOPES ARE APPROXIMATE AND BASED ON MAP PRODUCED BY AMERICAN DIGITAL CARTOGRAPHY, COPYRIGHT 1995, AND BASED ON 7.5 MINUTE SERIES MAPS, REVISED 1977, ZONE ID-W.
2. VERTICAL DATUM BASED ON NAD83 IDAHO STATE PLANE COORDINATE SYSTEM.
3. DRAINAGE AREAS ARE APPROXIMATE AND MAY NOT BE LINEAR AS INDICATED BY PLOT.

027-RI-CO-102Q
Coeur d'Alene Basin RI/FS
RI Report

EPA REGION 10

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08/05/2001

Table 3.2-1
Estimated Total Sediment Transport Upper South Fork

	Estimated Sediment Yield Ninemile Creek (Tons/Year/ Square Mile)	Estimated Sediment Yield Canyon Creek (Tons/Year/ Square Mile)	Average Sediment Yield Ninemile and Canyon (Tons/Year/ Square Mile)	Estimated Sediment Yield Upper South Fork (Tons/Year)
Fines	14	37	25	1,273
Sand	11	23	17	840
Bedload	10	2	6	300
Total	34	62	48	2,413

4.0 NATURE AND EXTENT OF CONTAMINATION

The nature and extent of contamination and mass loading in the Upper South Fork watershed are discussed in this section. Section 4.1 describes chemical concentrations found in environmental media, including horizontal and vertical extent. For each watershed segment, the discussion includes remedial investigation data chemical analysis results; comparison of chemical results to selected screening levels (Part 1, Section 5.1); and focused analysis of identified source areas. In Section 4.2, preliminary estimates of mass loading are presented.

4.1 NATURE AND EXTENT

The nature and extent of the ten metals of potential concern identified in Part 1, Section 5.1 (antimony, arsenic, cadmium, copper, iron, lead, manganese, mercury, silver, and zinc) in surface soil, subsurface soil, sediment, groundwater and surface water are discussed in this section. Locations with metals detected in any matrix at concentrations 1 times (1x), 10 times (10x) and 100 times (100x) the screening level were identified and presented in the following data summary tables. The magnitudes of exceedance (10x and 100x) were arbitrarily selected to delineate exceedance areas of contamination. Metals identified in this evaluation are further evaluated in either the human health or ecological risk assessments (under separate cover).

Historical and recent investigations at areas within the study area are listed and summarized in Part 1, Section 4. Data source references are included as Attachment 1. Chemical data collected in the Upper South Fork and used in this evaluation are summarized and included as Attachment 2. Data summary tables include sampling location, data source reference, collection date, depth, and reported concentration. Screening level exceedances are highlighted. Sampling locations are shown on Figures 4.1-1 through 4.1-4.

The nature and extent of contamination were evaluated by screening chemical results against applicable risk-based screening criteria and available background concentrations. Screening levels are used in this analysis to identify source areas and media (e.g., soil, sediment, groundwater, and surface water) of concern that will be evaluated in the feasibility study (FS).

Statistical summaries for each metal in surface soil, subsurface soil, sediment, groundwater, and surface water are included as Attachment 3 and discussed in the subsections below. The summaries include the number of samples analyzed; the number of detections; the minimum and maximum detected concentrations; the average and coefficient of variation; and the screening level (SL) to which the detected concentration is compared. Proposed screening levels were compiled from available federal numeric criteria (e.g., National Ambient Water Quality Criteria), regional preliminary remediation goals (PRGs) (e.g., EPA Region IX PRGs), regional baseline or background studies for soil, sediment, and surface water, and other guidance documents (e.g., National Oceanographic and Atmospheric Administration freshwater sediment screening values). The screening level selection process is discussed in detail in Part 1, Section 5.1.

Source areas within the Upper South Fork are presented in Table 4.1-1. These sites are based source areas initially identified by the BLM (1999) and further refined by CH2M HILL and URS during the RI/FS process. The table includes source area names, source ID, source area acres, description, number of samples by matrix type, and metals exceeding 1x, 10x, and 100x the screening levels in surface soil, subsurface soil, sediment, groundwater, and surface water.

It should be noted that the number of samples identified for each source area was determined using the project Geographical Information System. Only sampling locations located within a source area polygon (shown on Figures 4.1-1 through 4.1-4) are included in Table 4.1-1; therefore, there may be samples collected from source areas and listed in the data summary tables in Attachment 2 that are not accounted for in Table 4.1-1.

The following sections present segment-specific sampling efforts and results according to matrix type. Given the extensive geographic range of the Coeur d'Alene Basin, sampling efforts were focused on areas of potential concern; therefore, more samples were collected from known mining-impacted areas near the creek, than from other areas within the watershed.

4.1.1 Segment UpperSFCDRSeg01

4.1.1.1 Surface Soil

Thirty-five surface soil samples were collected in segment UpperSFCDRSeg01 from a depth of 0 to 0.5 feet and analyzed for total metals. Antimony, arsenic, cadmium, copper, lead, and zinc were detected at multiple sampling locations at concentrations greater than 10x the screening levels. Antimony, arsenic, lead and zinc were also detected at concentrations greater than 100x the screening levels.

4.1.1.2 Subsurface Soil

Fifteen subsurface soil samples were collected and analyzed for total metals. An additional 30 subsurface samples were analyzed for lead. Antimony, arsenic, cadmium, lead and zinc were detected at concentrations greater than 10x the screening levels at several locations. Arsenic, lead and zinc were also detected at concentrations greater than 100x the screening levels at multiple locations.

4.1.1.3 Sediment

Nineteen sediment samples were collected and analyzed for total metals. Antimony, arsenic, cadmium, lead, manganese, mercury, silver, and zinc were detected at one to many sampling locations at concentrations that exceeded 10x the screening levels. Lead and mercury were also detected in sediment samples at concentrations that exceeded 100x the screening levels.

4.1.1.4 Surface Water

Four hundred and thirty-three surface water samples for total metals and three hundred and sixteen surface water samples for dissolved metals were collected and analyzed in Upper SFCDRSeg01. Results for total metals showed concentrations for cadmium, copper, lead, manganese, and zinc at one to many sampling locations that exceeded 10x the screening levels, with concentrations of cadmium and zinc that exceeded 100x the screening levels. Results for dissolved metals also showed numerous samples with concentrations of antimony, cadmium, copper, lead, manganese and zinc that exceeded 10x the screening levels, along with concentrations of cadmium, copper, lead, manganese, and zinc that exceeded 100x the screening levels at least one location. Lead, manganese, and zinc were the metals detected most frequently above screening levels in surface water.

4.1.1.5 Identified Source Areas

Chemical data for surface soil, subsurface soil, sediment, groundwater, and surface water were reviewed together to identify source areas within segment UpperSFCDRSeg01 that may be significant contributors of metals to the Upper South Fork. Summary source area data are presented in Table 4.1-1.

Twenty-two of 309 source areas in this segment were sampled. Cadmium, copper, lead, manganese, and zinc were detected at concentrations greater than 10x the screening levels at many locations in this segment. Surface water collected from the South Fork Coeur d'Alene River Impacted Floodplain showed concentrations of dissolved antimony and lead, along with numerous concentrations of zinc that exceeded 100x and 10x the screening levels. Sediment samples also collected from the South Fork Coeur d'Alene River Impacted Floodplain showed concentrations of cadmium, lead, manganese, mercury, and zinc that exceeded 10x the screening levels.

4.1.1.6 Major Source Areas

Based on a cumulative assessment of chemical data for surface soil, subsurface soil, sediment, groundwater, and surface water (URS 2000, Appendix G), major source areas of concern were identified. The technical memorandum identified discrete mine/mill sites and tailings impoundments. Evaluation of potential source areas conducted for this RI/FS resulted in addition of floodplain reaches and other specific source areas. The six major source areas identified in segment UpperSFCDRSeg01 include:

- Grouse Gulch Mines (Star 1200 Level and West Star Mine)
- Morning No. 6 Mine and Mill
- Golconda Mine and Mill
- Upper South Fork Coeur d'Alene River Impacted Floodplain
- Lucky Friday Mine and tailings ponds
- Gold Hunter No. 6

These source areas are known to have high concentrations of metals resulting from historical mining activities. Figures 4.1-5 through 4.1-8 illustrate significant features for the first four major source areas listed above. Common features highlighted in the figures include tailing piles, waste rock piles, mine adits of known location, mining and mill-related structures, residential properties, the river, major roads and additional site-specific details.

The Upper South Fork Coeur d'Alene River Impacted Floodplain is shown in Figures 4.1-9 and 4.1-10. Major source areas identified in floodplains were mapped at a larger scale than the figures depicting discrete source areas. Both figures illustrate regional location, the river and associated floodplains, and major cities. Figure 4.1-9 includes the source area boundary as provided by the BLM for the Upper South Fork Coeur d'Alene River Impacted Floodplain and Figure 4.1-10 includes surficial geology units obtained from the U.S. Geological Survey (Box et al. 1999). Based on a comprehensive list created by Box et al. (1999), seven surficial geologic units of interest were identified and combined into a single area for this report. The seven geologic units include the following source material types:

- Fcgos: Flotation-era channel gravels and overlying overbank sediments
- JFti: Jig- and early flotation-era tailings impoundments
- JFms: Jig- and early flotation-era ore concentration millsite

- Joscu: Jig-era overbank sediments, copper impacted
- Jos: Jig-era overbank sediments over pre-mining channel gravel
- Jcgos: Jig-era channel gravels and overlying jig-era overbank sands
- Jrrf: Jig-era railroad embankment fill

These geology units form the basis of estimates of contaminated sediment volumes within the historical floodplain. Volume estimates are included in the Feasibility Study (URS 2001).

4.1.2 Adit and Seep Summary

Most adits and seeps with drainage that have been identified and sampled have flows under 1 cfs and relatively low concentrations of metals. However, very high concentrations of total zinc were measured in one of the adits identified in the Upper South Fork watershed (Gearheart et al. 1999). A total of twenty-seven adits and one seep were identified. Available adit and seep data for the Upper South Fork are summarized in Table 4.1.2 -1. Discharge, average total zinc concentration, average total zinc mass loading, and associated source areas are listed. Zinc mass loading from the Star 1200 Level and Morning No. 6 adits and the seep at the Morning No. 6 Waste Rock pile were greater than 1 pound per day. Total zinc mass loading for all adits and seeps identified in the Upper South Fork watershed is estimated to be approximately 20 pounds per day.

4.2 SURFACE WATER MASS LOADING

In Part 1 of this report (Setting and Methodology, Section 5.3.1), the concept of mass loading and its use in the remedial investigation was presented. Section 4.2 of the Canyon Creek Nature and Extent further discussed the use of plotting discrete sampling events versus the probabilistic analysis of the mass loading data in Fate and Transport.

This section presents the discrete mass loading measurements made during several low- and high-flow sampling events. The locations sampled during each event are plotted on a map of the watershed (Figure 4.2-1 through 4.2-10). Each sampling location shows the cumulative mass loading of lead or zinc and the difference in mass load from the next upstream location. The difference in mass load is indicated on the maps by the term "delta." The events were selected to show variations in mass loading throughout the stream system relative to source areas. To help with understanding mass loading in the South Fork, the figures show loading data along the Upper South Fork from above Larson to below Pinehurst. This includes mass loading data from tributaries to the South Fork. The events selected are not intended to represent all the available mass loading data. The remainder of this section presents the indicator metal correlation and selected maps with a discussion of discrete sampling events on a watershed basis.

4.2.1 Indicator Metal Correlation

In Section 4.2 of the Canyon Creek Watershed Nature and Extent, the correlation of chemical concentrations for 8 chemicals of potential concern (COPCs) are evaluated for total lead and dissolved zinc. These two metals appear to be reasonable indicators of the other chemicals of potential concern. The following mass loading discussion is limited to total lead and dissolved zinc.

4.2.2 Upper South Fork Watershed Mass Loading

Of the available sampling data, five sampling events were selected and mapped. Table 4.2-1 summarizes the sampling events, sampling locations and calculated mass loads for total lead and dissolved zinc. The low-flow events used were October 1991 (Figures 4.2-1 and 4.2-6), November 1997 (Figures 4.2-2 and 4.2-7) and November 1998 (Figures 4.2-3 and 4.2-8). The high flow events used were May 1991 (Figures 4.2-4 and 4.2-9) and May 1998 (Figure 4.2-5 and 4.2-10). Data from these sampling events is summarized in Table 4.2-1. The following sections discuss observations made from plotting the low- and high-flow mass loading data.

4.2.2.1 Total Lead Mass Loading

Loading observations are as follows:

Sampling location SF205 is located upstream of Larson near the boundary of segment UpperSFCDRSeg01. Low-flow total lead loading in the October 1991 and November 1997 sampling events were less than 1 pound per day. Down stream of sampling location SF205 lead load increases just above Mullan (SF215) and below Mullan (SF220). The changes in loading from the next upstream sampling location were 2 to 6 pounds per day. Downstream of sampling location SF220, the differences in mass load are low. Sampling location SF10, located near the downstream boundary of the segment, had a loading of 1 pound per day (October 1991). CC288, located in segment MidGradSeg01 but near the boundary of segment UpperSFCDRSeg01, had a measured loading of 10 pounds per day (November 1998). Overall the largest increase in total lead mass loading increases noted in the segment occurred downstream of the Gold Hunter mine and the Lucky Friday mine and tailings ponds. However, there are many other mines and potential sources in this area as noted in Section 4.1.

Under high-flow conditions, the most upstream sampling location (SF205, east of Larson) had a total lead loading of 3 pounds per day (May 1998). The highest down stream loading in the segment was 24 pounds per day (SF228, May 1998). As under low flow conditions, lead loads increase downstream of the Lucky Friday Mine and tailing ponds and the Gold Hunter No. 6. An additional increase of 12 pounds per day (May 1991) was observed downstream of the Golconda mill and mine site at sampling location SF228.

4.2.2.2 Dissolved Zinc Mass Loading

Loading observations are as follows:

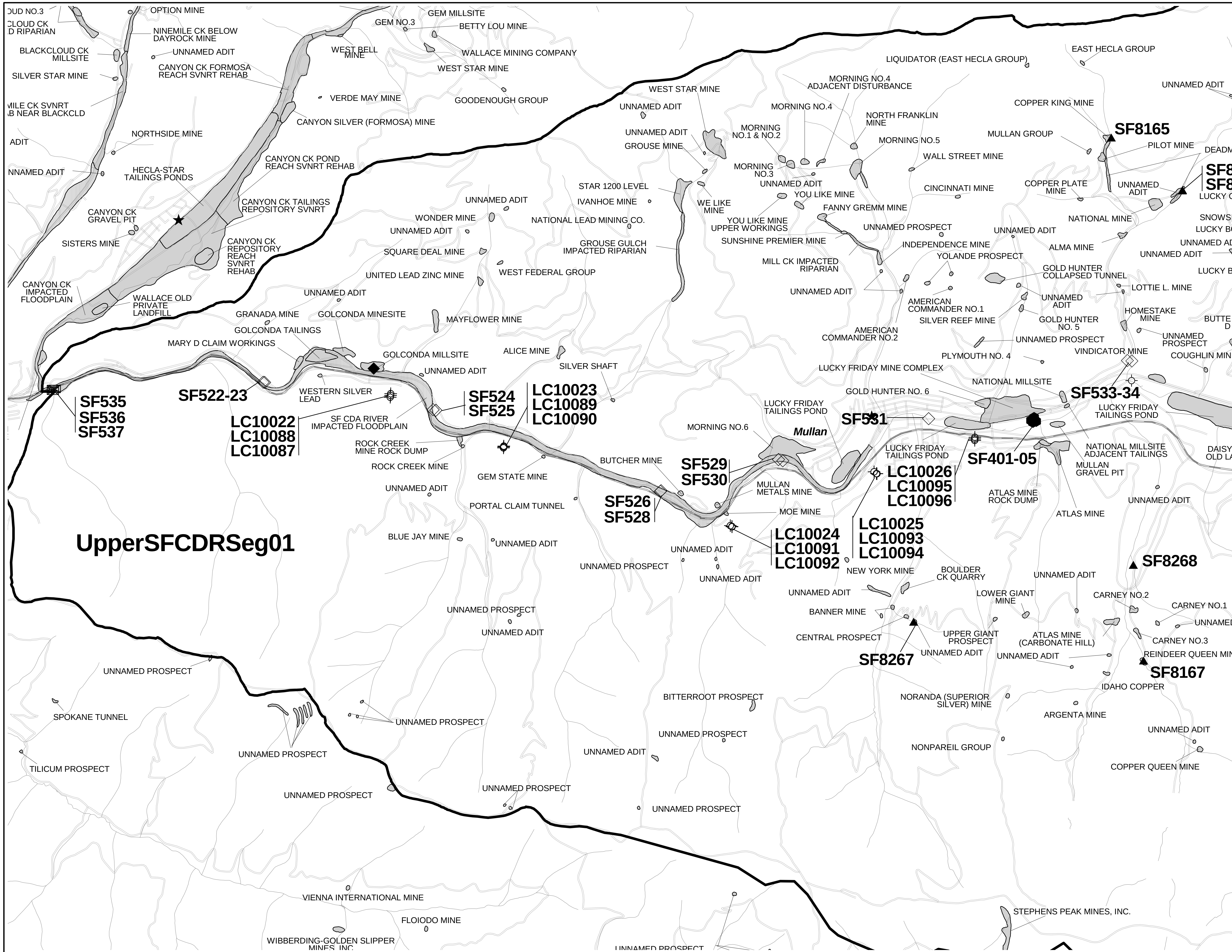
Low-flow total zinc loadings in the October 1991 and November 1997 sampling events were less than 1 pound per day at SF205. Downstream, the zinc load increases with a difference of 31 pounds per day measured below Mullan (SF220, November 1997). Further downstream zinc loading again increases at sampling locations SF227 and SF228 with differences in mass load of 17 to 29 pounds per day (November 1997), respectively. SF10 is the furthest downstream point in the segment for the sampling events plotted. This location had a loading of 2 pounds per day (October 1991).

Under high-flow conditions, the most upstream sampling location in the segment (SF205, east of Larson) had a total zinc loading of less than 1 pound per day (May 1998). From Larson to downstream of Mullan at sampling location SF220, zinc mass loading differences increase. At location SF220, below Mullan, the difference was 80 pounds per day dissolved zinc. Further downstream sampling locations SF227 and SF228, which bracket the Golconda mill and mine site, had differences of 52 and 193 pounds per day (May 1998), respectively. As under low flow conditions, zinc loads increase downstream of the Lucky Friday Mine and tailing ponds and the Gold Hunter No. 6. The total dissolved zinc mass load downstream of the Golconda was 343 pounds per day (May 1998).

4.2.2.3 Groundwater Mass Loading

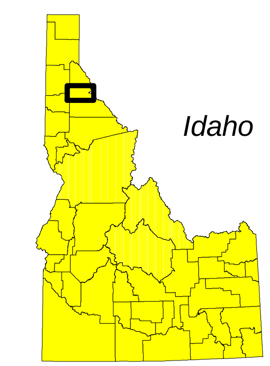
Information on subsurface conditions in this segment was not sufficient to evaluate mass loading in groundwater. However, based on the results of the seepage study conducted near Osburn (USGS 2000), areas where there is a widening of the floodplain are likely to be losing some surface water to groundwater. Some of the surface water loading in losing reaches of the stream may enter the groundwater system. In this segment, reaches where some floodplain development is evident start above Mullan and continue downstream.

Figure 4.1-1
Upper South Fork Coeur d'Alene River Segment UpperSFCDRSeg01 East Half Source Areas and Soil/Sediment Sampling Locations



LEGEND

- Ground Sampling Location
- Hand Auger Sampling Location
- Tailings Sampling Location
- Test Pit Sampling Location
- River Sampling Location
- Stream
- Road
- Interstate 90
- City
- Upper South Fork Coeur d'Alene River Segment 1
- Source Area and Name



Location Map

NOTES

1) Base map coverages obtained from the Coeur d'Alene Tribe, URS Greiner Inc., CH2M HILL, and the Bureau of Land Management.

2) Sampling locations obtained from URS Greiner Inc. Technical Data Management database as of 3/29/00.

SCALE 1:44,000

0 0.5 1 Miles

N

027-RI-C0-102Q
Coeur d'Alene Basin RI/FS
RI/FS REPORT

EPA REGION 10

Document Control 4162500.6615.05a
Generation 1
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V:USFCDARIVER SOIL
E:soil east
L: Final RI USFCDAR Soil East
7/24/2001

This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: July 24, 2001

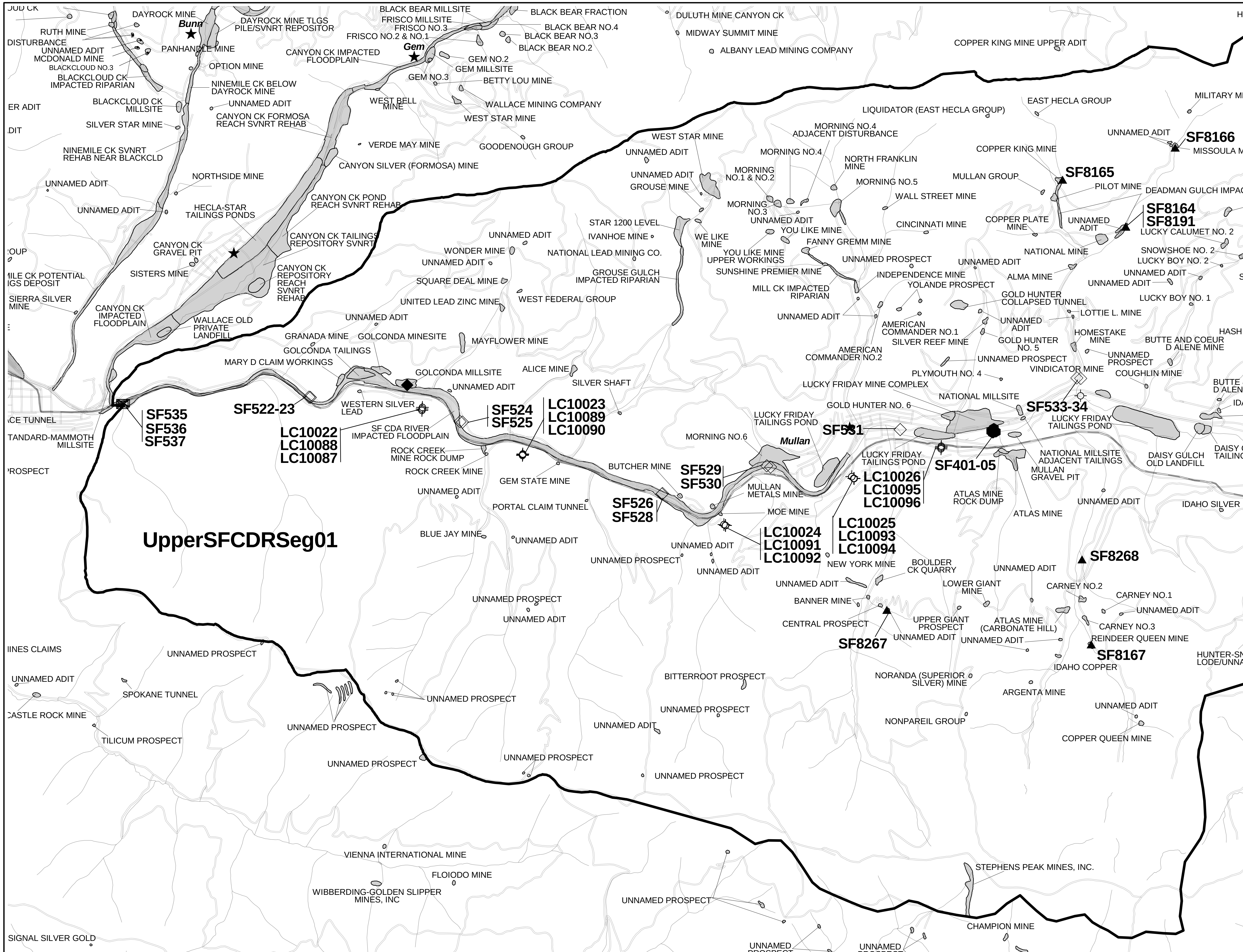
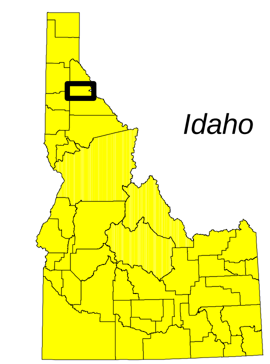


Figure 4.1-2
Upper South Fork Coeur d'Alene River Segment UpperSFCDRSeg01 West Half Source Areas and Soil/Sediment Sampling Locations

LEGEND

- Bore Hole Sampling Location
- Ground Sampling Location
- Hand Auger Sampling Location
- Tailings Sampling Location
- Test Pit Sampling Location
- River Sampling Location
- Stream
- Road
- Interstate 90
- City
- Upper South Fork Coeur d'Alene River Segment 1
- Source Area and Name



Location Map

NOTES

1) Base map coverages obtained from the Coeur d'Alene Tribe, URS Greiner Inc., CH2M HILL, and the Bureau of Land Management.

2) Sampling locations obtained from URS Greiner Inc.Technical Data Management database as of 3/29/00.

SCALE 1:44,000

0 0.5 1 Miles

N

027-RI-CO-102Q
Coeur d'Alene Basin RI/FS
RI/FS REPORT

EPA REGION 10

Document Control 4162500.6615.05a
Generation 1
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V:USFCDARIVER SOIL
E:soil west
L: Final RI USFCDAR Soil West
7/24/2001

This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: July 24, 2001

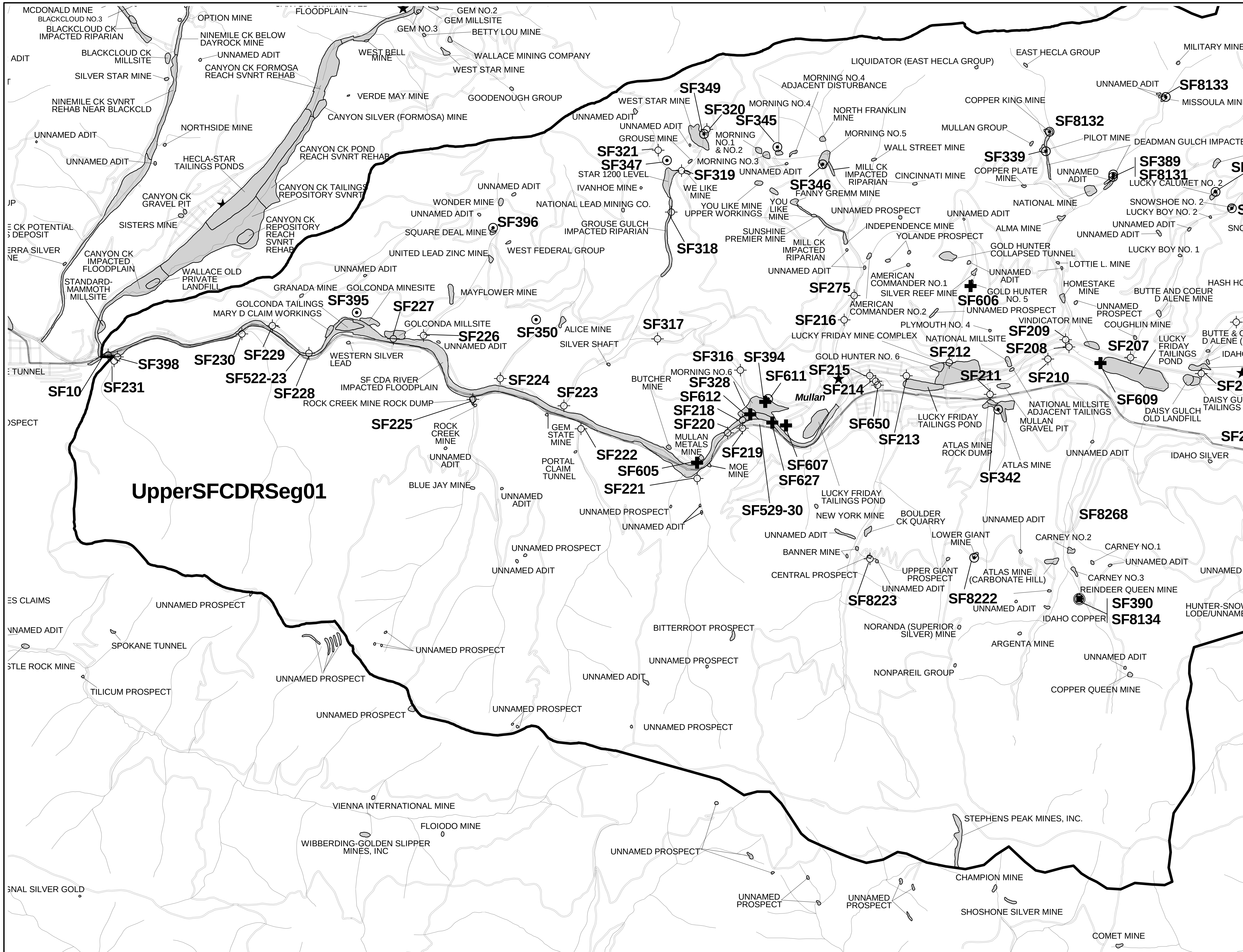
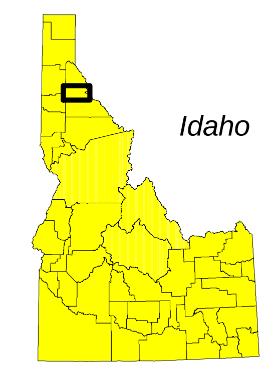


Figure 4.1-3
Upper South Fork Coeur d'Alene River Segment UpperSFCDRSeg01 East Half Source Areas and Surface Water Sampling Locations

LEGEND

- Seep Sampling Location
- Adit Sampling Location
- Outfall Sampling Location
- Wetlands/Marsh Sampling Location
- River Sampling Location
- Stream
- Road
- Interstate 90
- City
- Upper South Fork Coeur d'Alene River Segment 1
- Source Area and Name



Location Map

NOTES

1) Base map coverages obtained from the Coeur d'Alene Tribe, URS Greiner Inc., CH2M HILL, and the Bureau of Land Management.

2) Sampling locations obtained from URS Greiner Inc. Technical Data Management database as of 3/29/00.

SCALE 1:44,000

0 0.5 1 Miles

N

027-RI-CO-102Q
Coeur d'Alene Basin RI/FS
RI REPORT

EPA REGION 10

Doc Control 4162500.6615.05.a
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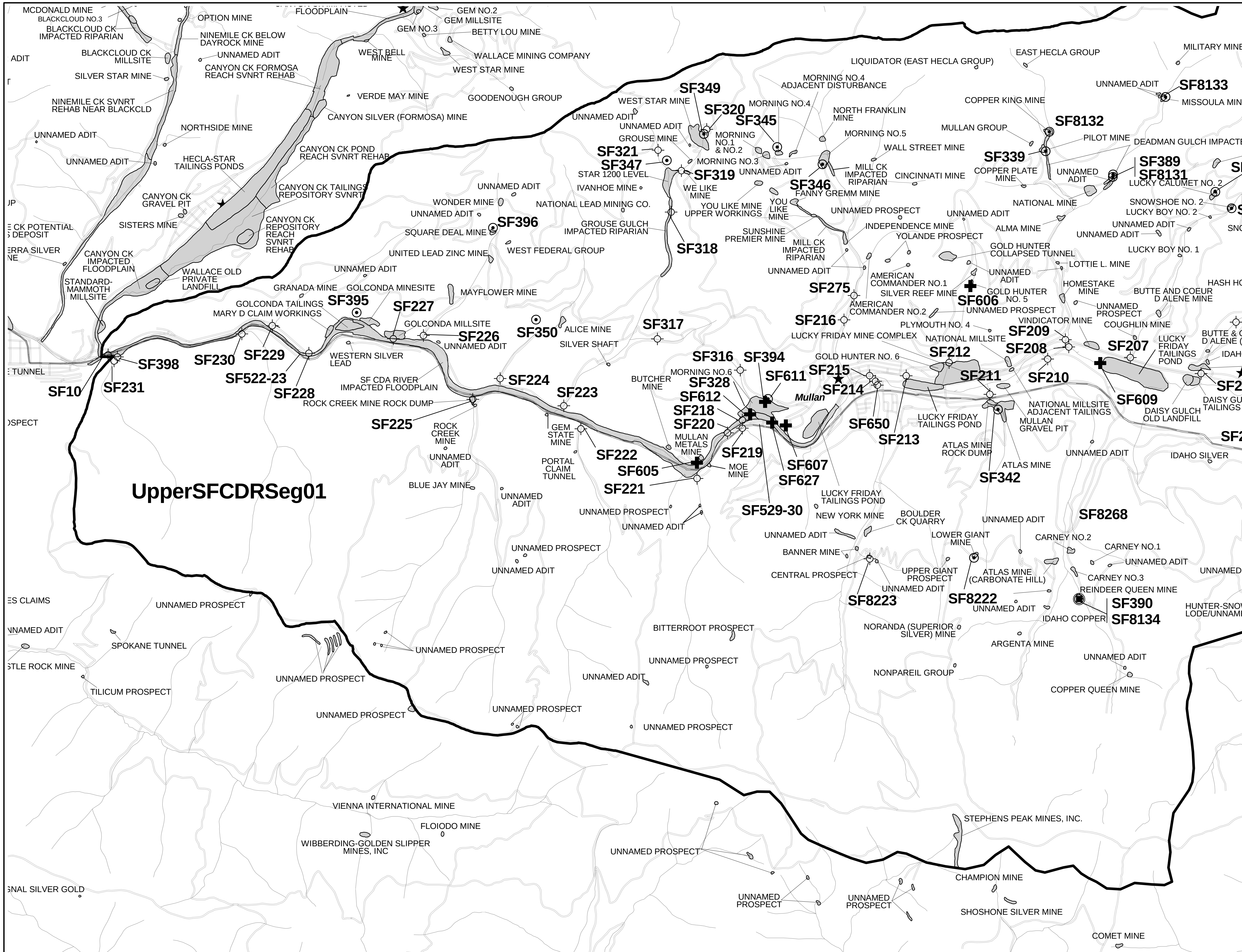
V:USFCDAR SURFACE WATER
E:SW EAST
L: USFCDAR East Surface Water
08/06/01

This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

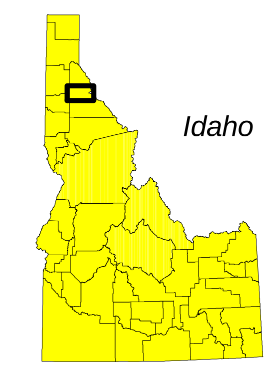
Date of Plot: July 8, 2001

Figure 4.1-4
Upper South Fork Coeur d'Alene River Segment UpperSFCDRSeg01 West Half Source Areas and Surface Water Sampling Locations



LEGEND

- Seep Sampling Location
- Adit Sampling Location
- Outfall Sampling Location
- Wetlands/Marsh Sampling Location
- River Sampling Location
- Stream
- Road
- Interstate 90
- City
- Upper South Fork Coeur d'Alene River Segment 1
- Source Area and Name



Location Map

NOTES

1) Base map coverages obtained from the Coeur d'Alene Tribe, URS Greiner Inc., CH2M HILL, and the Bureau of Land Management.

2) Sampling locations obtained from URS Greiner Inc. Technical Data Management database as of 3/29/00.

SCALE 1:44,000

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N

027-RI-CO-102Q
Coeur d'Alene Basin RI/FS
DRAFT RI/FS REPORT

EPA REGION 10

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E:SW WEST
L: USFCDAR WEST Surface Water
5/16/2000

This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: MAY 16, 2000

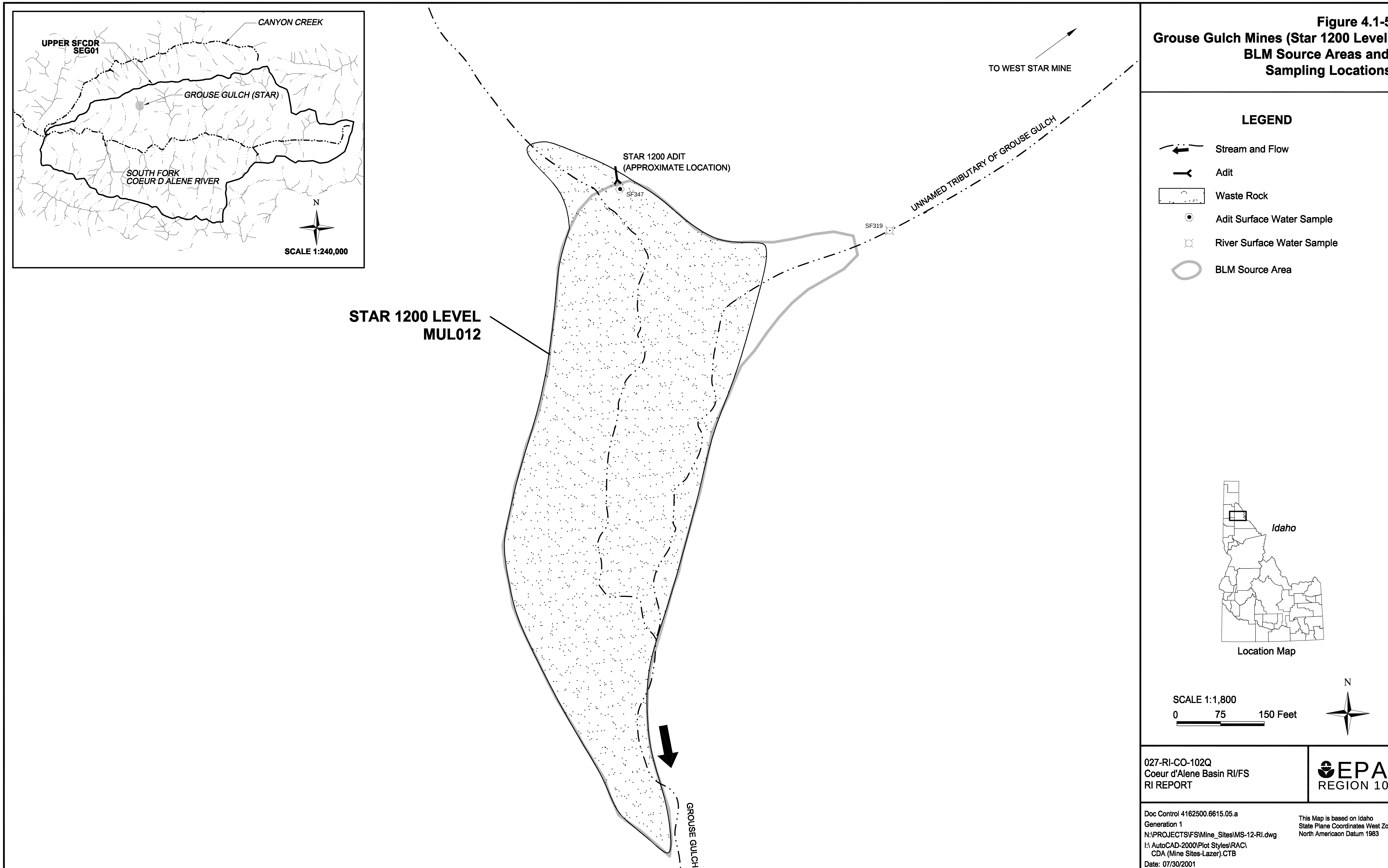

Figure 4.1-5
Grouse Gulch Mines (Star 1200 Level)
BLM Source Areas and
Sampling Locations

027-RI-CO-102Q
Coeur d'Alene Basin RI/FS
RI REPORT

EPA
REGION 10

Doc Control 4162500.6615.05.a
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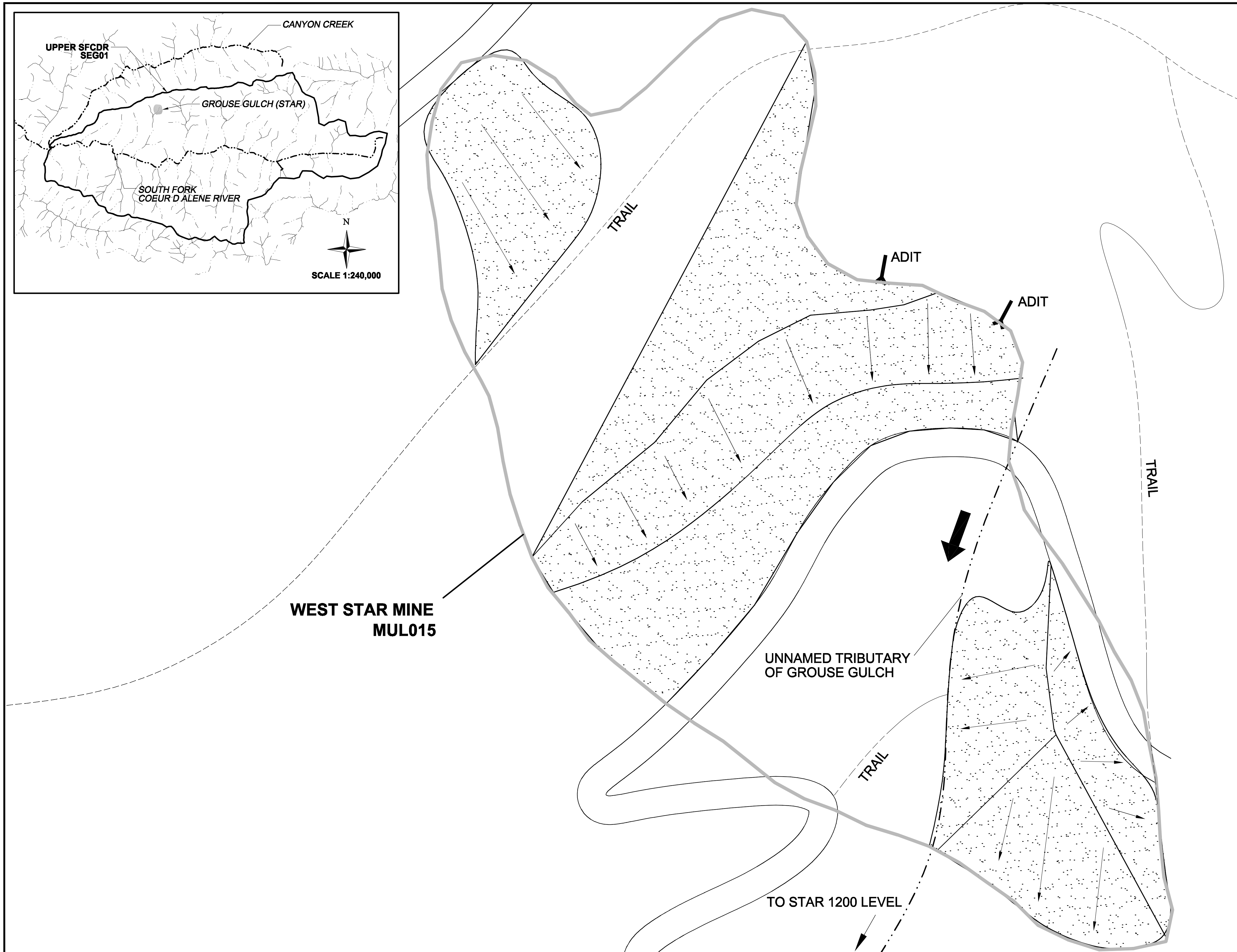
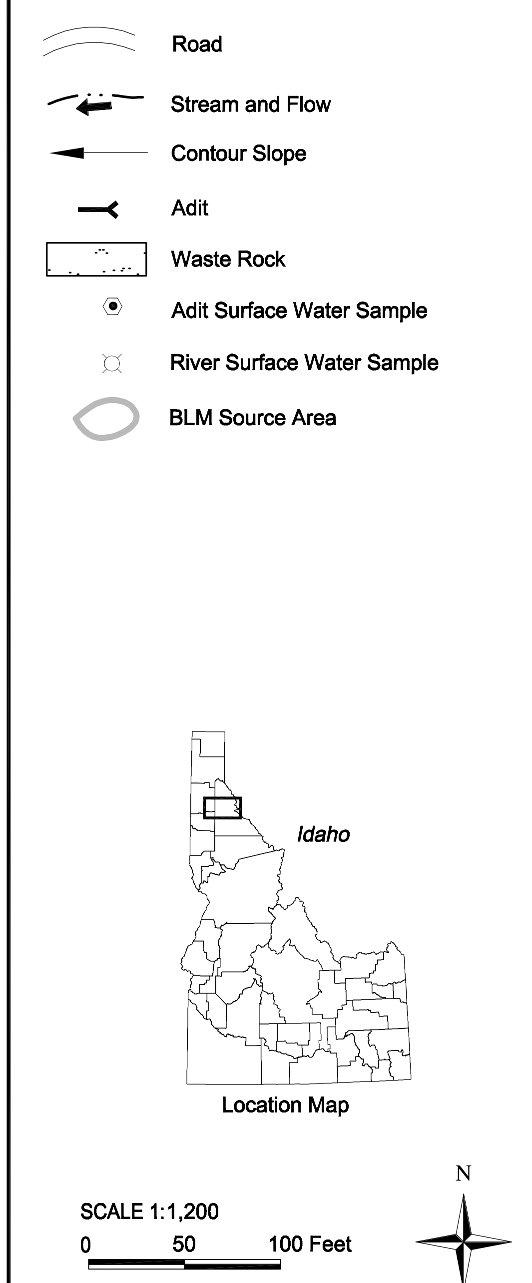
CDA (Mine Sites-Lazer).CTB
Date: 07/30/2001

This Map is based on Idaho
State Plane Coordinates West Zone,
North Americaon Datum 1983

Figure 4.1-6
Grouse Gulch Mines (West Star Mine) BLM Source Areas and Sampling Locations



LEGEND



027-RI-CO-102Q
Coeur d'Alene Basin RI/FS
RI REPORT

EPA
REGION 10

Doc Control 4162500.6615.05.a
Generation 1
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Date: 07/30/01

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Date of Plot: June 30, 2001

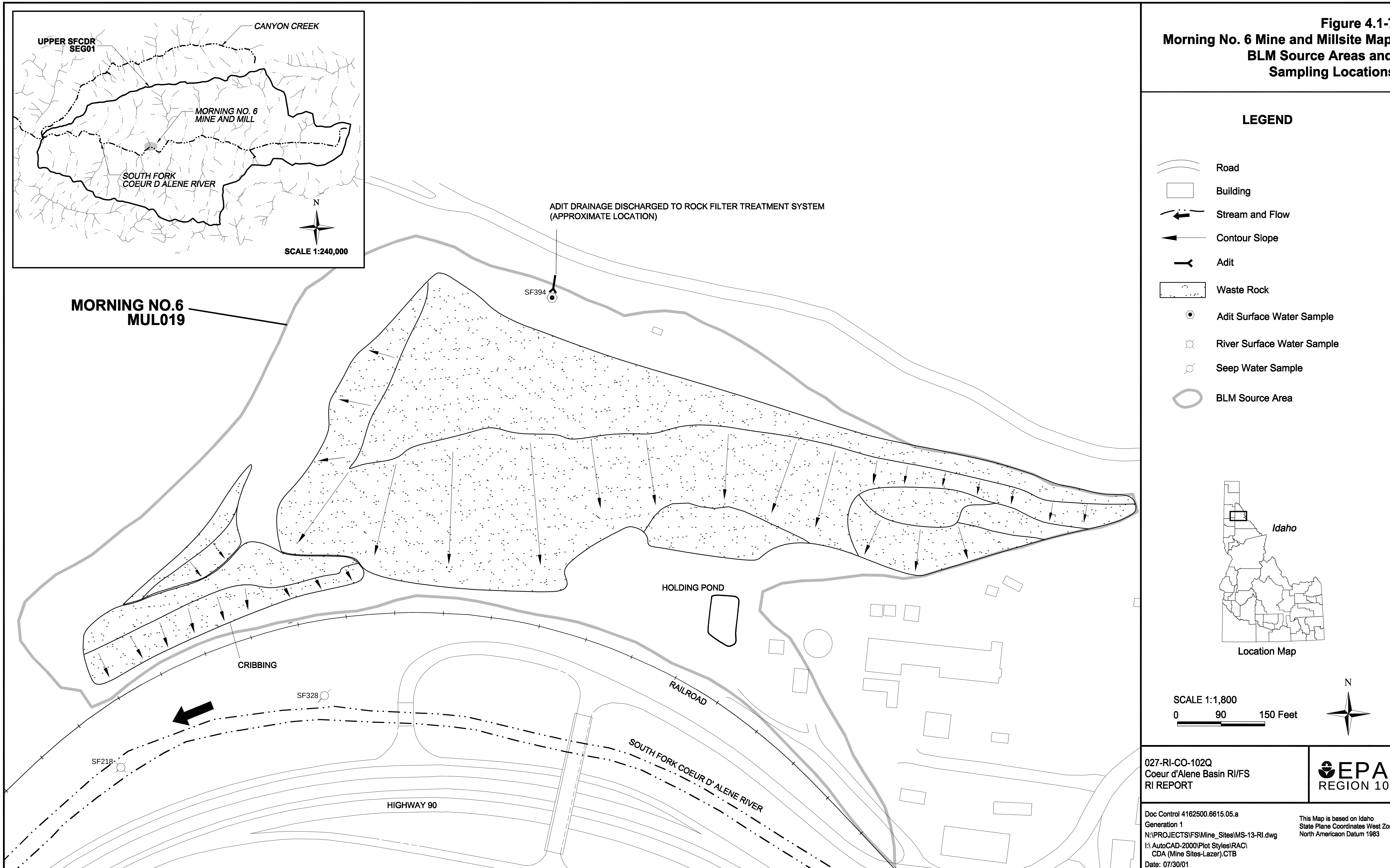

Figure 4.1-7
Morning No. 6 Mine and Millsite Map, BLM Source Areas and Sampling Locations

027-RI-CO-102Q
Coeur d'Alene Basin RI/FS
RI REPORT

EPA
REGION 10

Doc Control 4162500.6615.05.a
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Date: 07/30/01

This Map is based on Idaho State Plane Coordinates West Zone, North Americaon Datum 1983

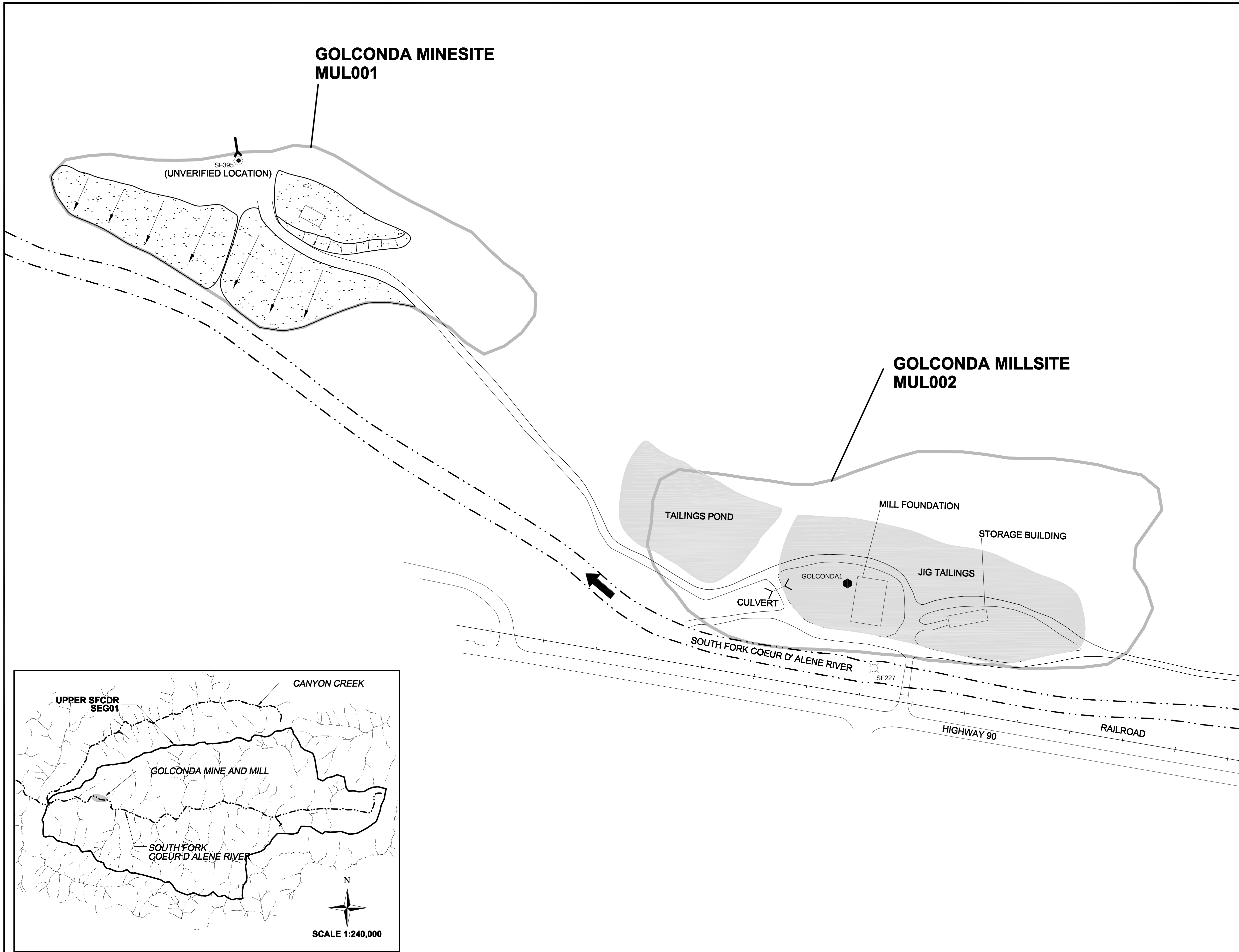
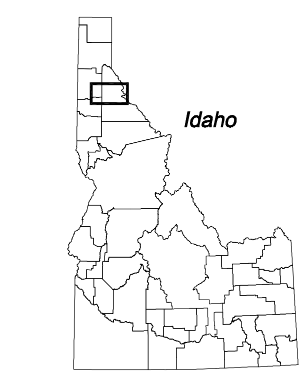


Figure 4.1-8
Golconda Mine and Millsite Map,
BLM Source Areas and
Sampling Locations

LEGEND

Road
Building
Stream and Flow
Contour Slope
Adit
Waste Rock
Tailings
Adit Surface Water Sample
River Surface Water Sample
Surface/Near Surface Soil Sample
BLM Source Area



SCALE 1:1,800
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027-RI-CO-102Q
Coeur d'Alene Basin RI/FS
RI REPORT

EPA REGION 10

Doc Control 4162500.6615.05.a
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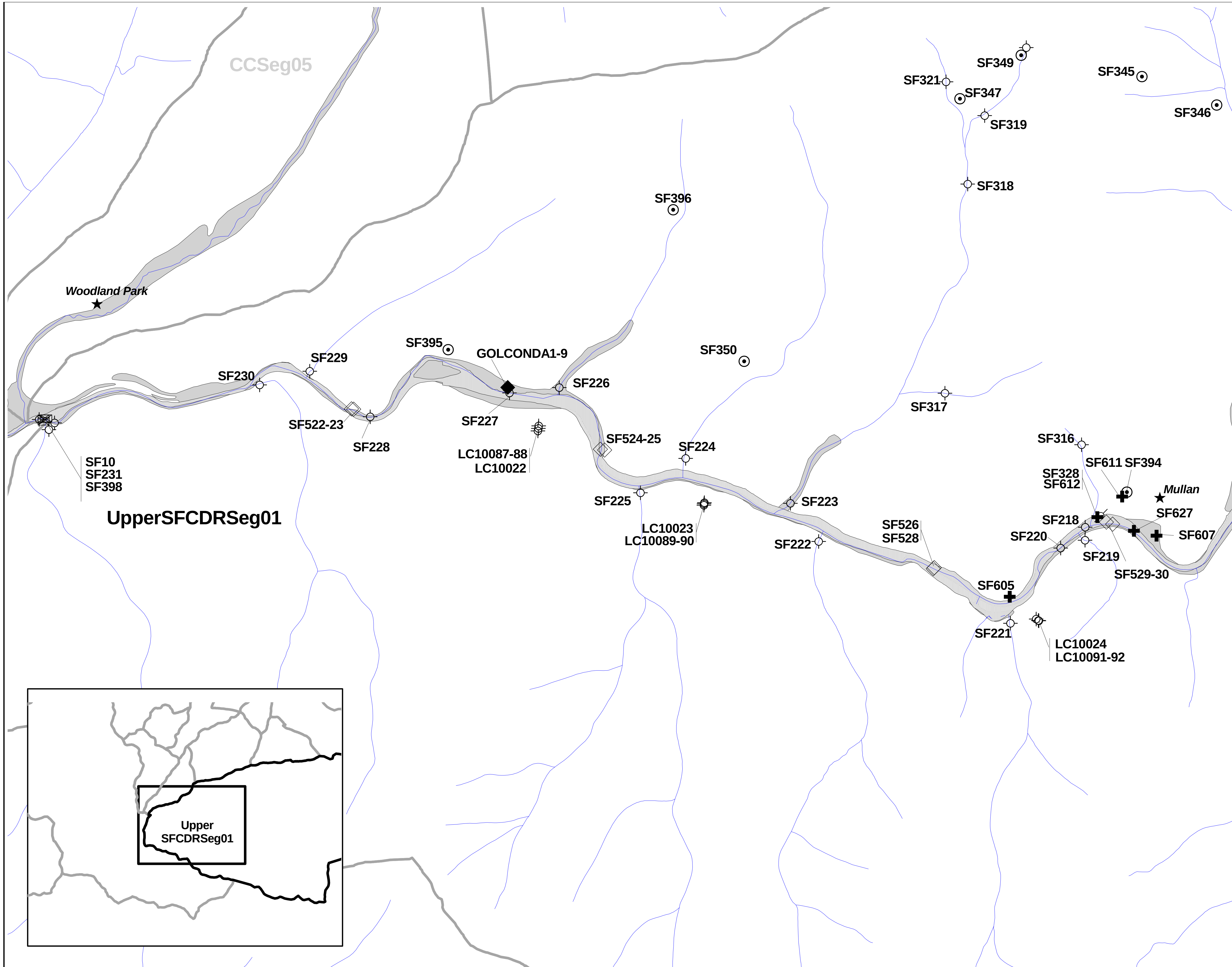
CDA (Mine Sites-Lazer).CTB
Date: 07/30/01

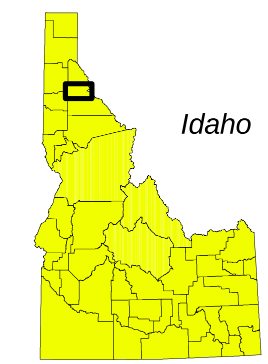
This Map is based on Idaho State Plane Coordinates West Zone, North Americaon Datum 1983

Figure 4.1-9
Upper SFCDR Impacted Floodplain BLM Source Areas and Sampling Locations



LEGEND

- Adit Sampling Location
- Bore Hole Sampling Location
- Floodplain Sampling Location
- Ground Sampling Location
- Hand Auger Sampling Location
- Lake Sampling Location
- Outfall Sampling Location
- River Sampling Location
- Seep Sampling Location
- Tailings Sampling Location
- Test Pit Sampling Location
- City
- Stream
- River
- River Segment Boundary
- BLM Source Area
- Floodplain



Location Map

NOTES

1) Base map coverages obtained from the Coeur d'Alene Tribe, URS Greiner, Inc., CH2M HILL, and the Bureau of Land Management.

2) Sampling locations obtained from URS Greiner, Inc. Technical Data Management database as of 3/29/00.

N

SCALE 1:26,000

0 0.5 Miles

027-RI-CO-102Q
Coeur d' Alene Basin RI/FS
RI REPORT

EPA REGION 10

Document Control 4162500.6615.05.a
Generation 1
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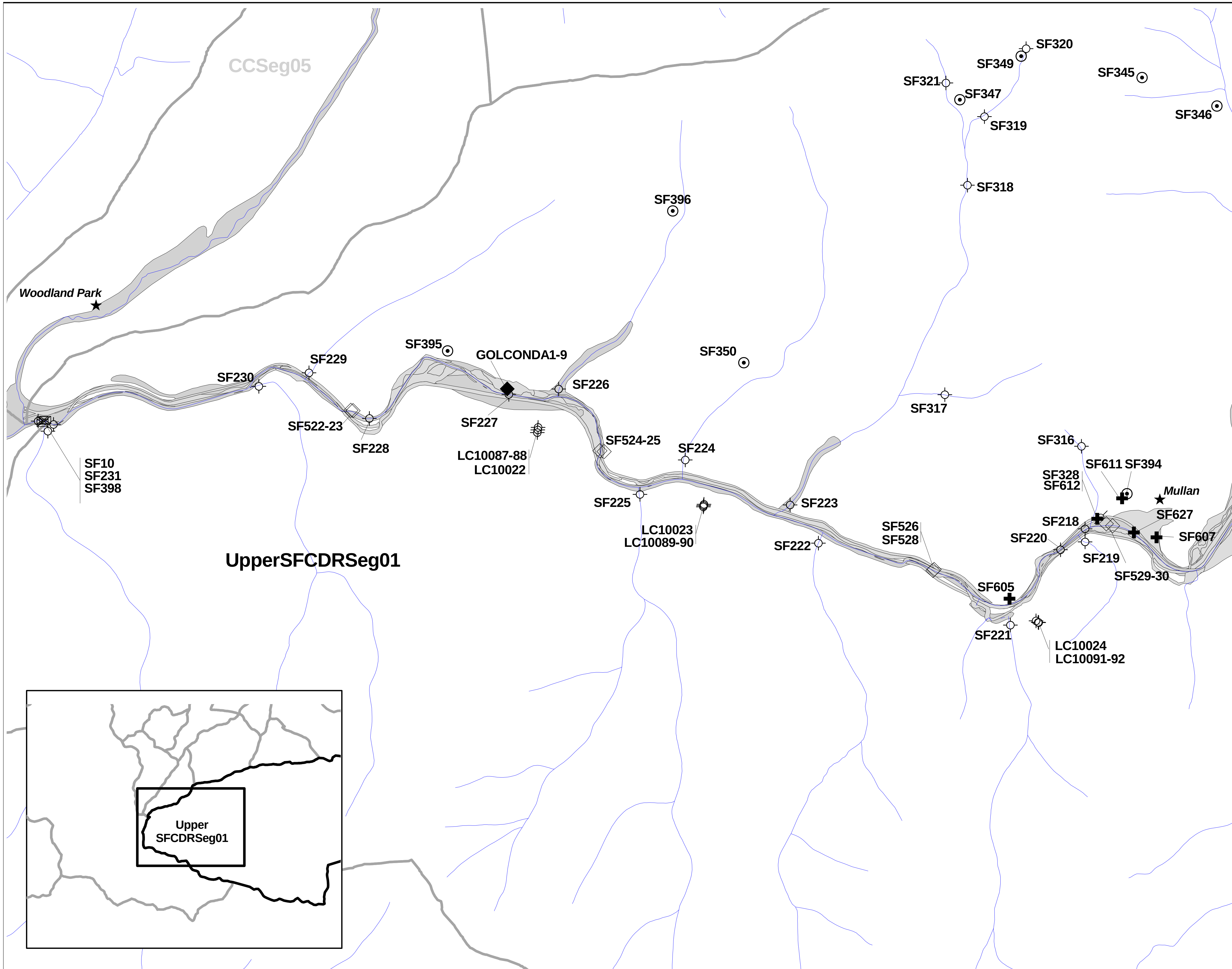
V: SFCDR
E:SFCDR
L: Final RI SFCDR
7/24/2001

This Map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983

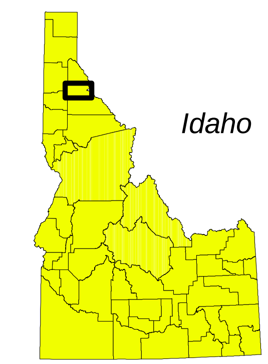
Date of Plot: July 24, 2001

Figure 4.1-10
Upper SFCDR Impacted Floodplain Geologic Units and Sampling Locations



LEGEND

- Adit Sampling Location
- Bore Hole Sampling Location
- Floodplain Sampling Location
- Ground Sampling Location
- Hand Auger Sampling Location
- Lake Sampling Location
- Outfall Sampling Location
- River Sampling Location
- Seep Sampling Location
- Tailings Sampling Location
- Test Pit Sampling Location
- City
- Stream
- River
- River Segment Boundary
- Geologic Units *
- Floodplain



Location Map

NOTES

1) Base map coverages obtained from the Coeur d'Alene Tribe, URS Greiner, Inc., CH2M HILL, and the Bureau of Land Management.

2) Sampling locations obtained from URS Greiner, Inc. Technical Data Management database as of 3/29/00.

*Box,S.E., A.A. Bookstrom, and W.N Kelly. 1999. Surficial geology of the valley of the South Fork of the Coeur d'Alene River, Idaho. U.S. Geological Survey Open File Report 99-XXX. Draft version, October 1999; and ArcView GIS Coverage, January 2000.

SCALE 1:26,000

0 0.5 Miles

N

027-RI-CO-102Q
Coeur d' Alene Basin RI/FS
RI REPORT

EPA REGION 10

Document Control 4162500.6615.05.a
Generation 1
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V: SFCDR GU
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L: Final RI SFCDR GU
7/27/2001

This Map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983

Date of Plot: July 27, 2001

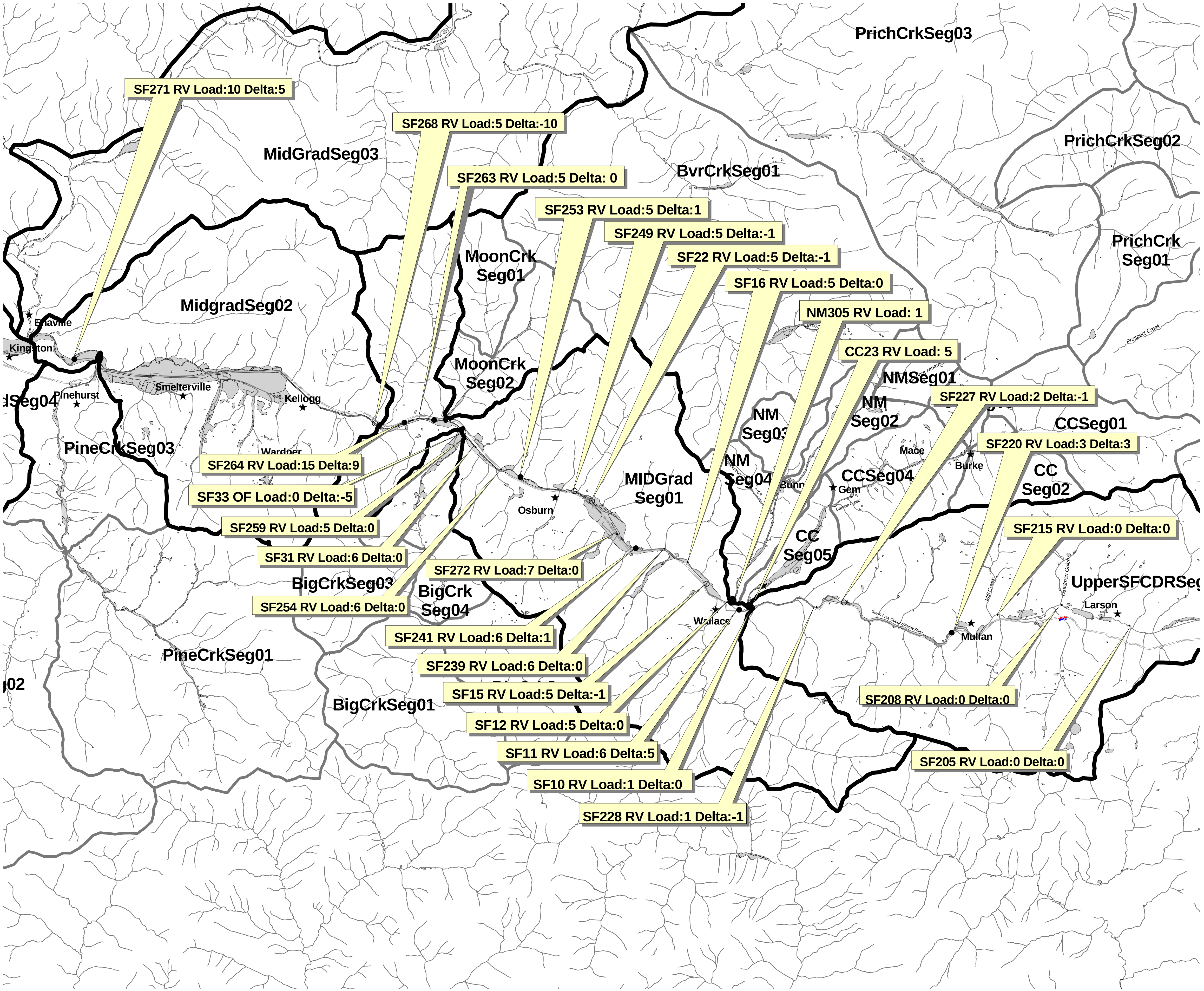

Figure 4.2-1
Upper South Fork Coeur d' Alene River Watershed
Total Lead Mass Loading
Sampling Results Oct. 1991

LEGEND

Sampling Location — SF271 RV Load: 10 Delta: 6 — Values are lbs/day

Location Type:
RV: River/Stream Sampling Location

(-) Neg. (+) Pos. Delta of Mass Load Compared to Preceeding Upstream Sampling Location

Delta Range: 0 - 0.9
Delta Range: 1 - 20
Delta Range: 20 - 40
Delta Range: 40 - 100
Delta Range: 100 - 150
Delta Range: > 150

Stream
Interstate 90
City
River/Lake
Midgrad/USFCDR Watershed
River Segment
Source Area

Location Map

NOTES

1) Base map coverages obtained from the Coeur d' Alene Tribe, URS Greiner Inc., CH2M HILL, and the Burueau of Land Management.

SCALE 1: 160,000
0 3 Miles

N

027-RI-C0-102Q
Coeur d' Alene RI/FS
RI Report

EPA REGION 10

Document Control 4162500.6615.05a
Generation 1
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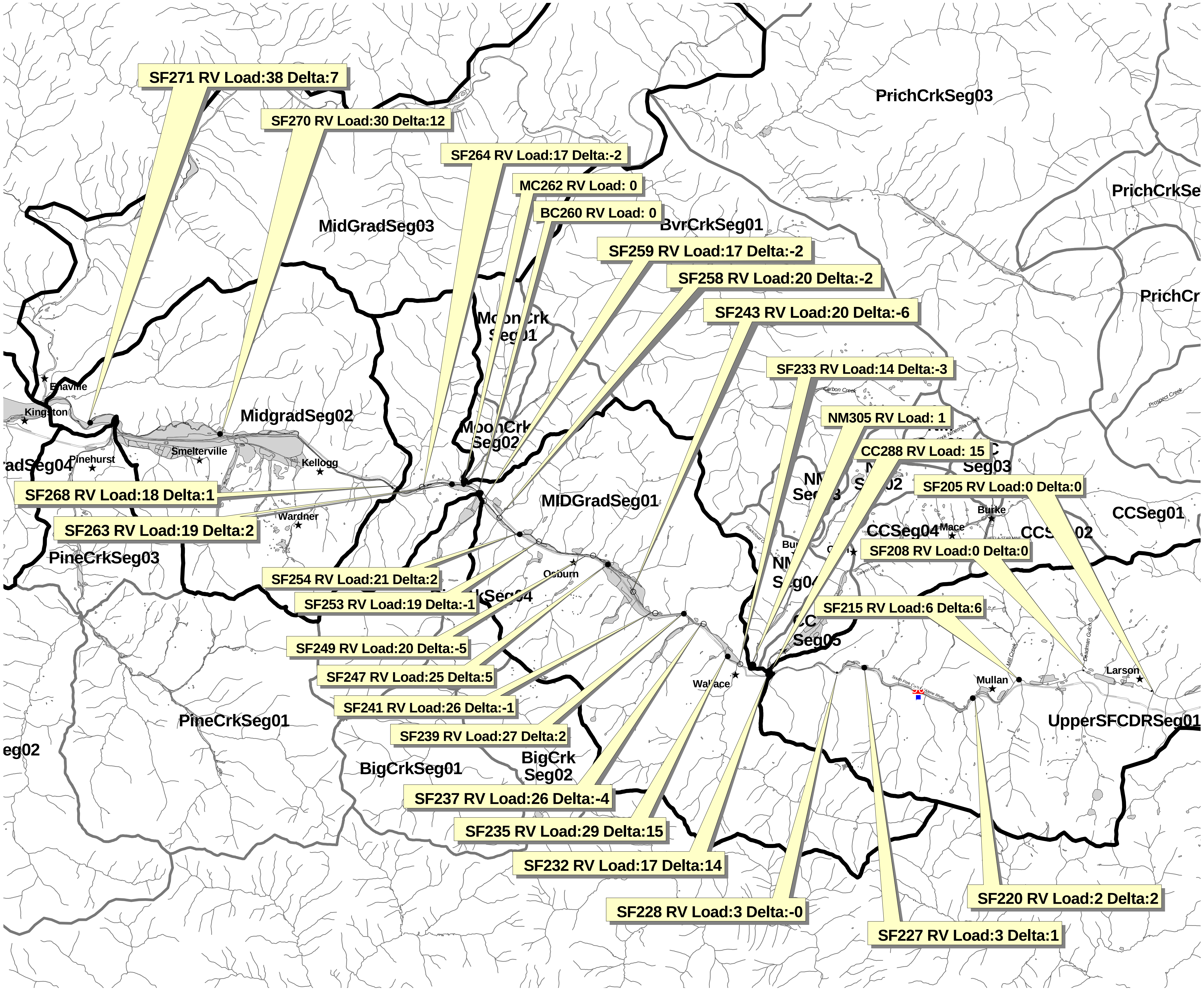
incremental_watershed_usfcdr_7-24.apr
V: SF-oct91-lead
L: Final RI SF-oct91-lead
7/24/2001

This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: July 24, 2001

Figure 4.2-2
Upper South Fork Coeur d' Alene River Watershed
Total Lead Mass Loading
Sampling Results Nov. 1997



Sampling Location

LEGEND

SF271 RV Load: 88 Delta: 8

Values are lbs/day

Location Type:

RV: River/Stream Sampling Location

(-) Neg. (+) Pos. Delta of Mass Load Compared to Preceeding Upstream Sampling Location

Delta Range: 0 - 0.9

Delta Range: 1 - 20

Delta Range: 20 - 40

Delta Range: 40 - 100

Delta Range: 100 - 150

Delta Range: > 150

Stream

Interstate 90

City

River/Lake

Midgrad/USFCDR Watershed

River Segment

Source Area

Location Map

NOTES

1) Base map coverages obtained from the Coeur d' Alene Tribe, URS Greiner Inc., CH2M HILL, and the Burueau of Land Management.

SCALE 1: 160,000

0 3 Miles

N

027-RI-C0-102Q
Coeur d' Alene RI/FS
RI Report

EPA REGION 10

Document Control 4162500.6615.05.a
Generation 1
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incremental_watershed_usfcdr.apr
V: SF-nov97-lead
L: Final RI SF-nov97-lead
7/24/2001

This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: July 24, 2001

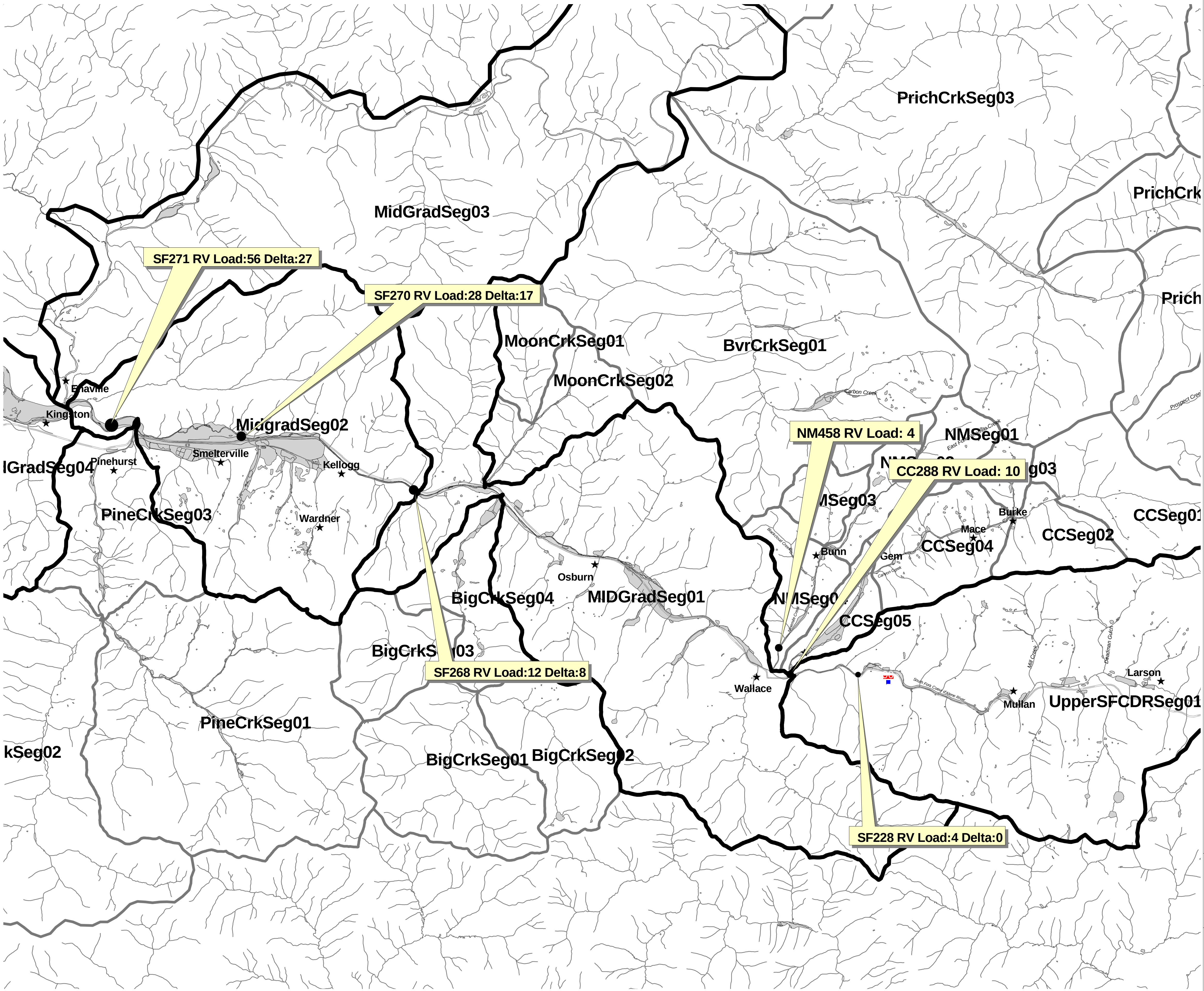

Figure 4.2-3
Upper South Fork Coeur d' Alene River Watershed
Total Lead Mass Loading
Sampling Results Nov. 1998

LEGEND

Sampling Location

Values are lbs/day

SF 268 RV Load: 2055 Delta: 76

Location Type:

RV: River/Stream Sampling Location

(-) Neg.	(+) Pos.	Delta of Mass Load Compared to Preceeding Upstream Sampling Location
		Delta Range: 0 - 0.9
		Delta Range: 1 - 20
		Delta Range: 20 - 40
		Delta Range: 40 - 100
		Delta Range: 100 - 150
		Delta Range: > 150

Stream
Interstate 90
City
River/Lake
Midgrad/USFCDR Watershed
River Segment
Source Area

Location Map

NOTES

1) Base map coverages obtained from the Coeur d' Alene Tribe, URS Greiner Inc., CH2M HILL, and the Burueau of Land Management.

SCALE 1: 160,000

0 3 Miles

027-RI-C0-102Q
Coeur d' Alene RI/FS
RI Report

EPA REGION 10

Document Control 4162500.6615.05.a
Generation 1
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incremental_watershed_usfcdr_7-24.apr
V: SF-nov98-lead
L: Final RI SF-nov98-lead
7/24/2001

This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: July 24, 2001

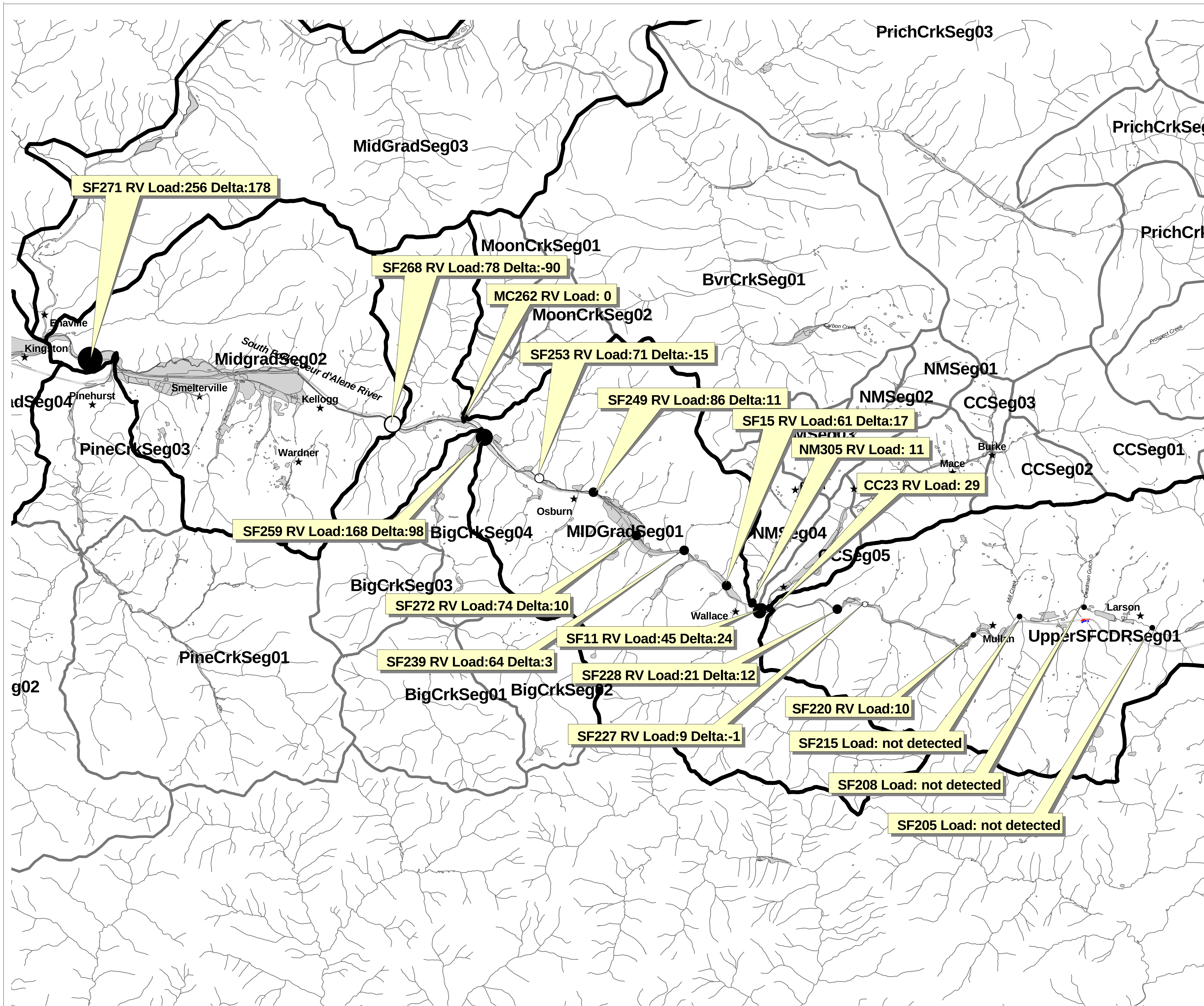

Figure 4.2-4
Upper South Fork Coeur d' Alene River Watershed
Total Lead Mass Loading
Sampling Results May 1991

LEGEND

Sampling Location — SF271 RV Load: 256 Delta: 178 — Values are lbs/day

Location Type:
RV: River/Stream Sampling Location

(-) Neg.	(+) Pos.	Delta of Mass Load Compared to Preceeding Upstream Sampling Location
		Delta Range: 0 - 0.9
		Delta Range: 1 - 20
		Delta Range: 20 - 40
		Delta Range: 40 - 100
		Delta Range: 100 - 150
		Delta Range: > 150

- Stream
- Interstate 90
- City
- River/Lake
- Midgrad/USFCDR Watershed
- River Segment
- Source Area

Idaho

Location Map

NOTES

1) Base map coverages obtained from the Coeur d' Alene Tribe, URS Greiner Inc., CH2M HILL, and the Burueau of Land Management.

SCALE 1: 160,000

0 3 Miles

N

027-RI-C0-102Q
Coeur d' Alene RI/FS
RI Report

EPA REGION 10

Document Control 4162500.6615.05.a
Generation 1
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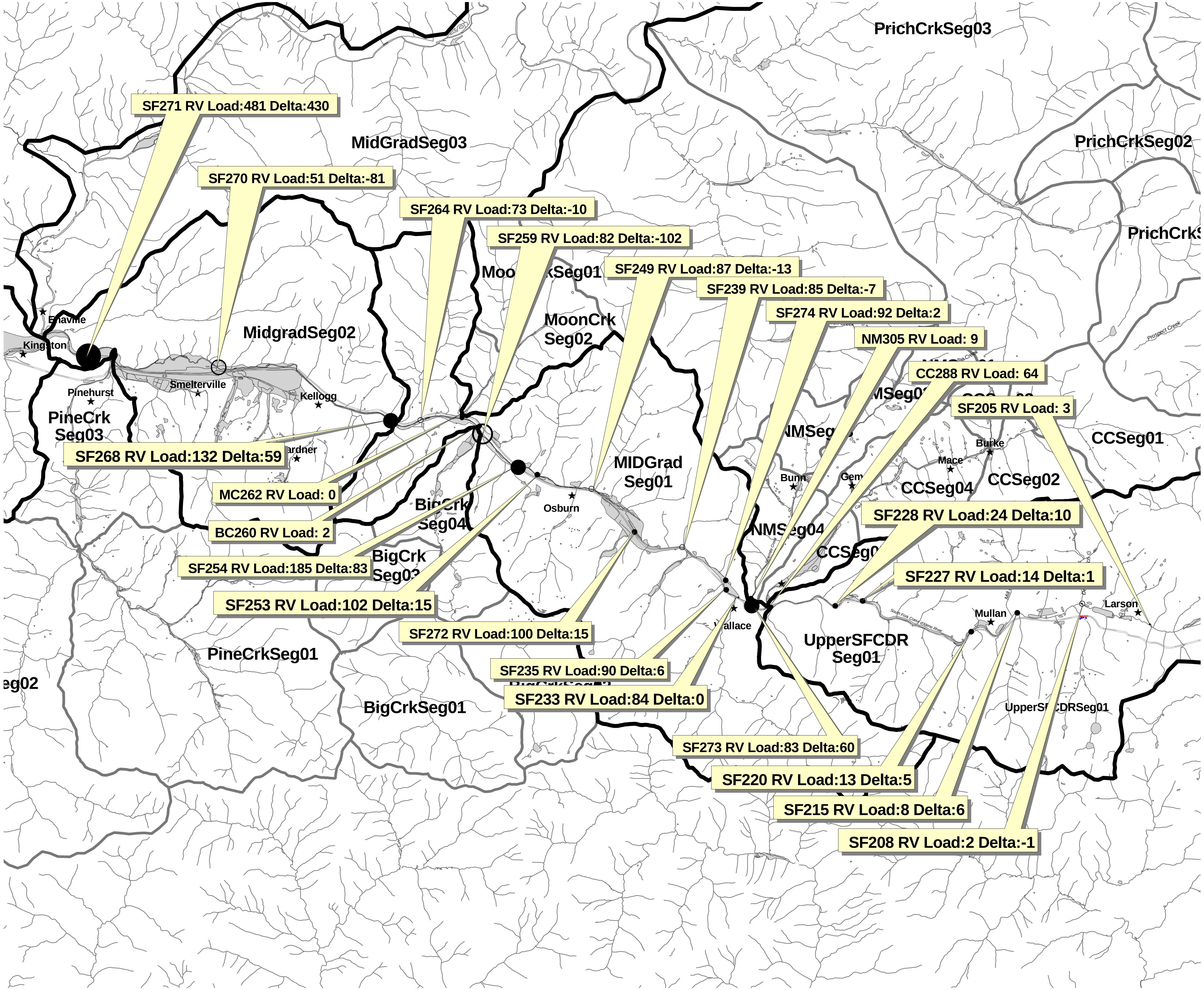
incremental_watershed_usfcdr_7-24.apr
V: SF-may91-lead
L: Final RI SF-may91-lead
7/24/2001

This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: July 24, 2001

Figure 4.2-5
Upper South Fork Coeur d' Alene River Watershed
Total Lead Mass Loading
Sampling Results May 1998



Sampling Location

LEGEND

Values are lbs/day

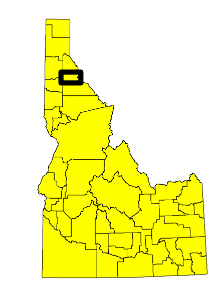
SF270 RV Load: 51 Delta: -81

Location Type:

RV: River/Stream Sampling Location

(-) Neg.	(+) Pos.	Delta of Mass Load Compared to Preceeding Upstream Sampling Location
		Delta Range: 0 - 0.9
○	●	Delta Range: 1 - 20
○	●	Delta Range: 20 - 40
○	●	Delta Range: 40 - 100
○	●	Delta Range: 100 - 150
○	●	Delta Range: > 150

- Stream
- Interstate 90
- ★ City
- River/Lake
- Midgrad/USFCDR Watershed
- River Segment
- Source Area



Location Map

NOTES

1) Base map coverages obtained from the Coeur d' Alene Tribe, URS Greiner Inc., CH2M HILL, and the Burueau of Land Management.

SCALE 1: 160,000

0 4 Miles

N

027-RI-C0-102Q
Coeur d' Alene RI/FS
RI Report

EPA REGION 10

Document Control 4162500.6615.05.a
Generation 1
n:\Projects\watersheds\
incremental_watershed_usfcdr_7-24.apr
V: SF-may98-lead
L: Final RI SF-may98-lead
7/24/2001

This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: July 24, 2001

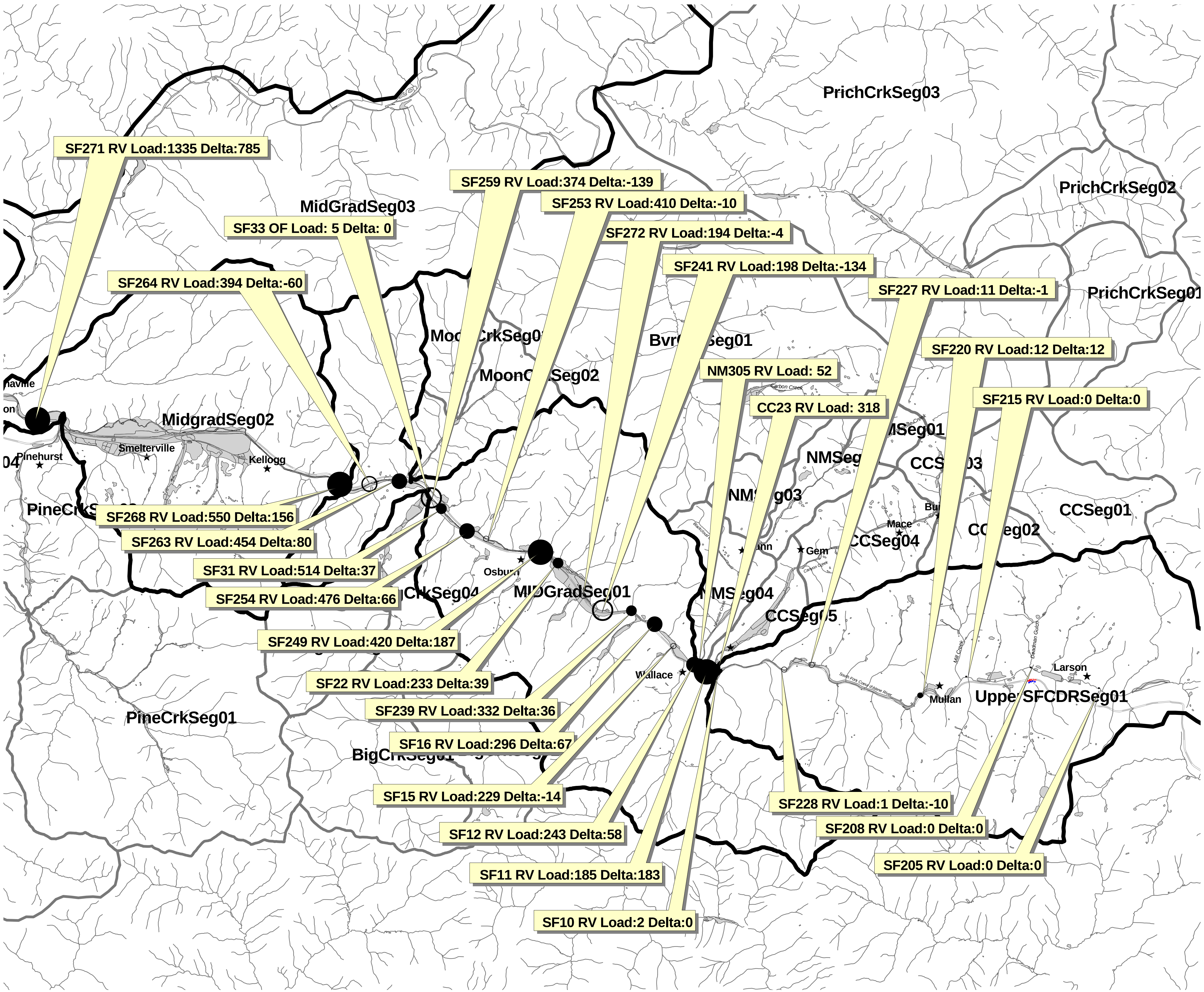


Figure 4.2-6
Upper South Fork Coeur d' Alene River Watershed Dissolved Zinc Mass Loading Sampling Results Oct. 1991

LEGEND

Sampling Location: SF271 RV Load: 5256 Delta: 2919

Values are lbs/day

Location Type:
RV: River/Stream Sampling Location
OF: Outfall Sampling Location

(-) Neg. | (+) Pos. | Delta of Mass Load Compared to Preceeding Upstream Sampling Location

- Delta Range: 0 - 0.9
- Delta Range: 1 - 20
- Delta Range: 20 - 40
- Delta Range: 40 - 100
- Delta Range: 100 - 150
- Delta Range: > 150
- Stream
- Interstate 90
- City
- River/Lake
- Midgrad/USFCDR Watershed
- River Segment
- Source Area

Location Map

NOTES

1) Base map coverages obtained from the Coeur d' Alene Tribe, URS Greiner Inc., CH2M HILL, and the Burueau of Land Management.

SCALE 1: 160,000

0 3 Miles

N

027-RI-C0-102Q
Coeur d' Alene Basin RI/FS
RI Report

EPA REGION 10

Document Control 4162500.6615.05.a
Generation 1
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incremental_watershed_usfcdr_7-24.apr
V: SF-oct91-zinc
L: Final RI SF-oct91-zinc
7/24/2001

This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: July 24, 2001

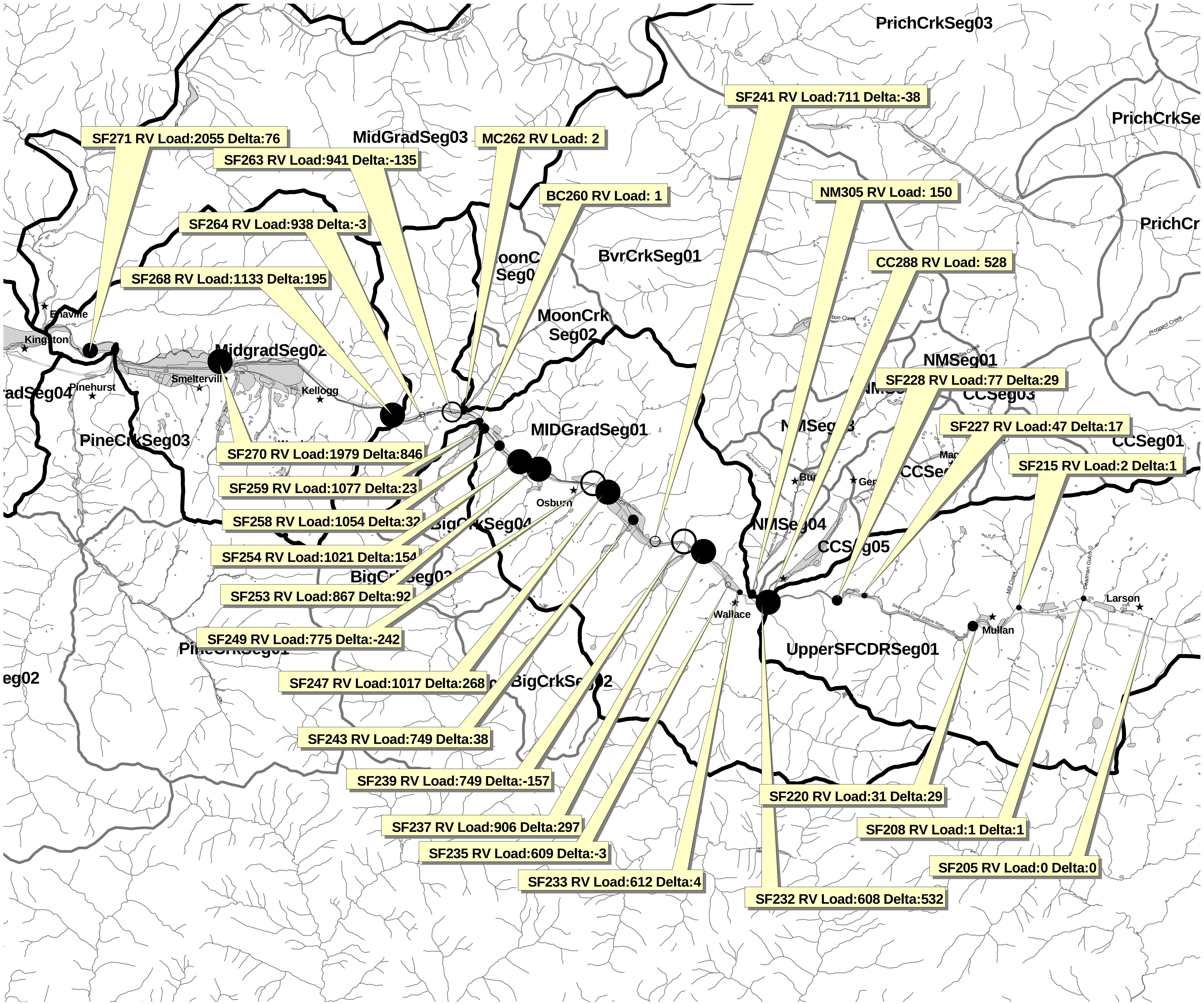


Figure 4.2-7
Upper South Fork Coeur d' Alene River Watershed
Dissolved Zinc Mass Loading
Sampling Results Nov. 1997

LEGEND

Sampling Location — SF271 RV Load: 256 Delta: 178 — Values are lbs/day

Location Type:
RV: River/Stream Sampling Location

(-) Neg. (+) Pos. Delta of Mass Load Compared to Preceeding Upstream Sampling Location

- Delta Range: 0 - 0.9
- Delta Range: 1 - 20
- Delta Range: 20 - 40
- Delta Range: 40 - 100
- Delta Range: 100 - 150
- Delta Range: > 150
- Stream
- Interstate 90
- City
- River/Lake
- Midgrad/USFCDR Watershed
- River Segment
- Source Area

Location Map

NOTES

1) Base map coverages obtained from the Coeur d' Alene Tribe, URS Greiner Inc., CH2M HILL, and the Burueau of Land Management.

SCALE 1: 160,000

0 — 3 Miles

027-RI-C0-102Q
Coeur d' Alene RI/FS
RI Report

EPA REGION 10

Document Control 4162500.6615.05.a
Generation 1
n:\Projects\watersheds\incremental_watershed_usfcdr_7-24.apr
V: SF-nov97-zinc
L: Final RI SF-nov97-zinc
7/24/2001

This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: July 24, 2001

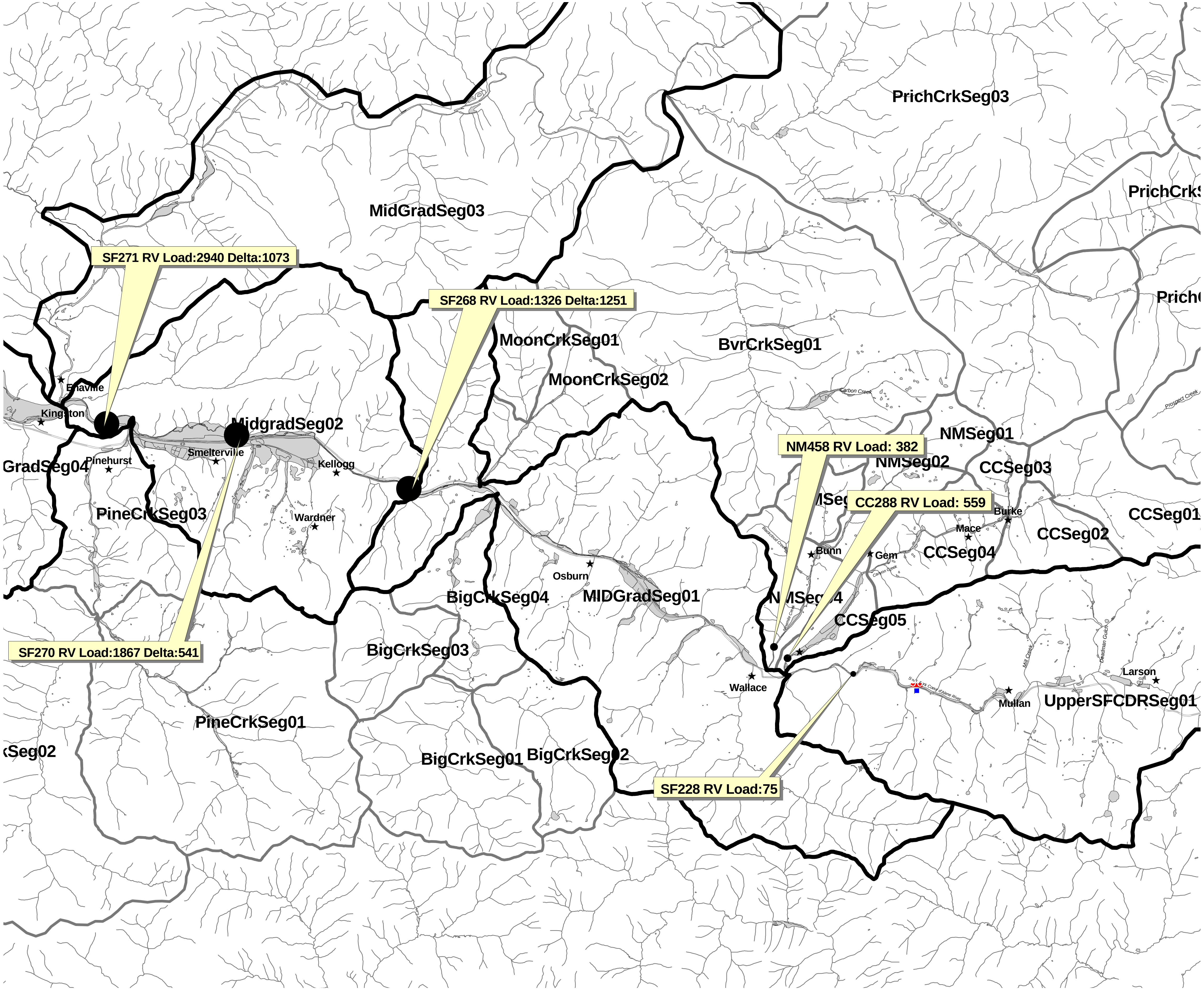


Figure 4.2-8
Upper South Fork Coeur d' Alene River Watershed
Dissolved Zinc Mass Loading
Sampling Results Nov. 1998

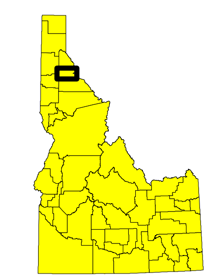
LEGEND

Sampling Location — SF 368 RV Load: 1133 Delta: 195 — Values are lbs/day

Location Type:
RV: River/Stream Sampling Location

(-) Neg.	(+) Pos.	Delta of Mass Load Compared to Preceeding Upstream Sampling Location
		Delta Range: 0 - 0.9
○	●	Delta Range: 1 - 20
○	●	Delta Range: 20 - 40
○	●	Delta Range: 40 - 100
○	●	Delta Range: 100 - 150
○	●	Delta Range: > 150

Stream
Interstate 90
★ City
River/Lake
Midgrad/USFCDR Watershed
River Segment
Source Area



Location Map

NOTES

1) Base map coverages obtained from the Coeur d' Alene Tribe, URS Greiner Inc., CH2M HILL, and the Burueau of Land Management.

SCALE 1: 160,000

0 3 Miles

027-RI-C0-102Q
Coeur d' Alene Basin RI/FS
RI Report

EPA REGION 10

Document Control 4162500.6615.05a
Generation 1
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incremental_watershed_usfcdr_7-24.apr
V: SF-nov98-zinc
L: Final RI SF-nov98-zinc
7/24/2001

This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: July 24, 2001

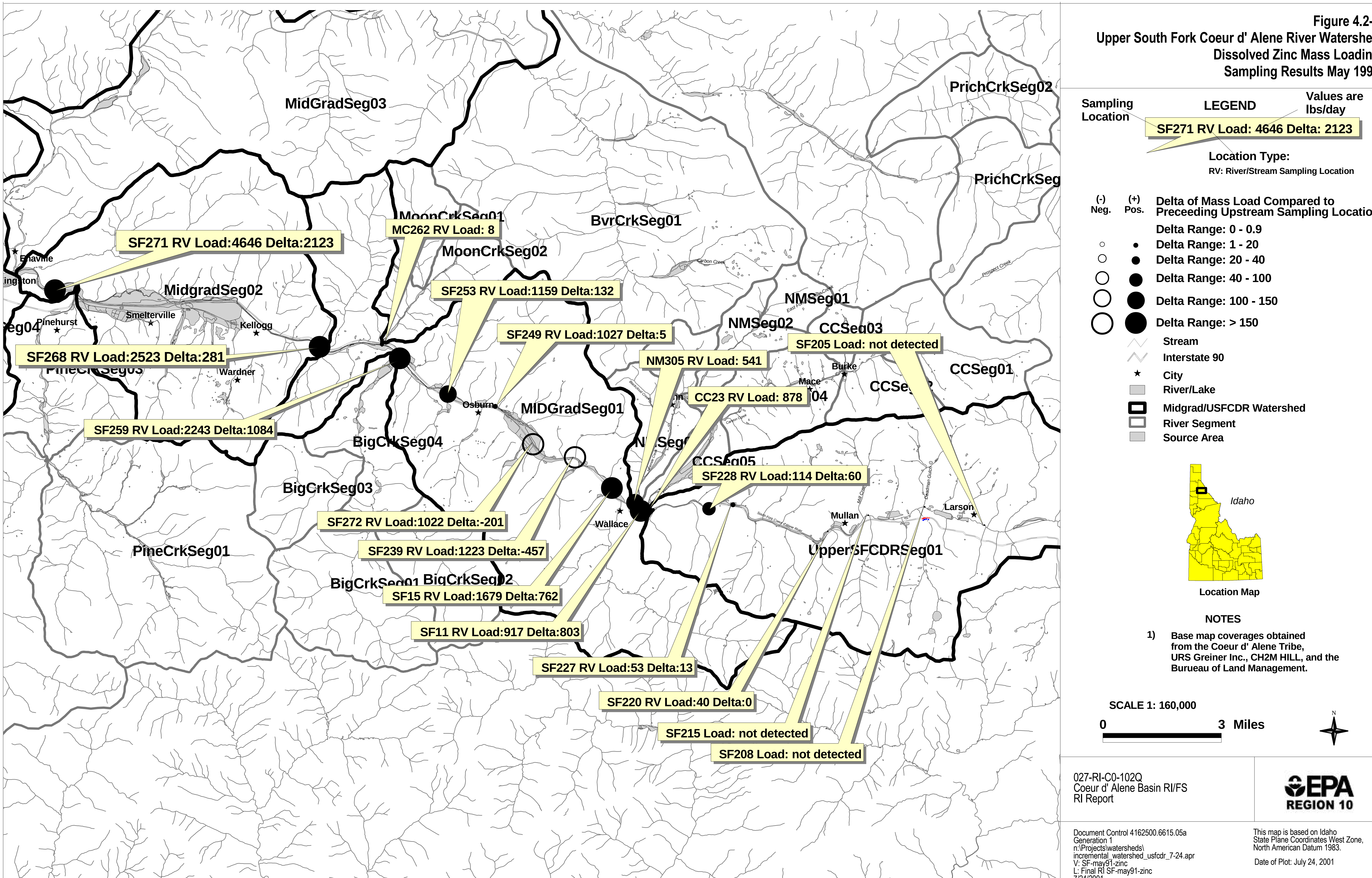

Figure 4.2-9
Upper South Fork Coeur d' Alene River Watershed
Dissolved Zinc Mass Loading
Sampling Results May 1991

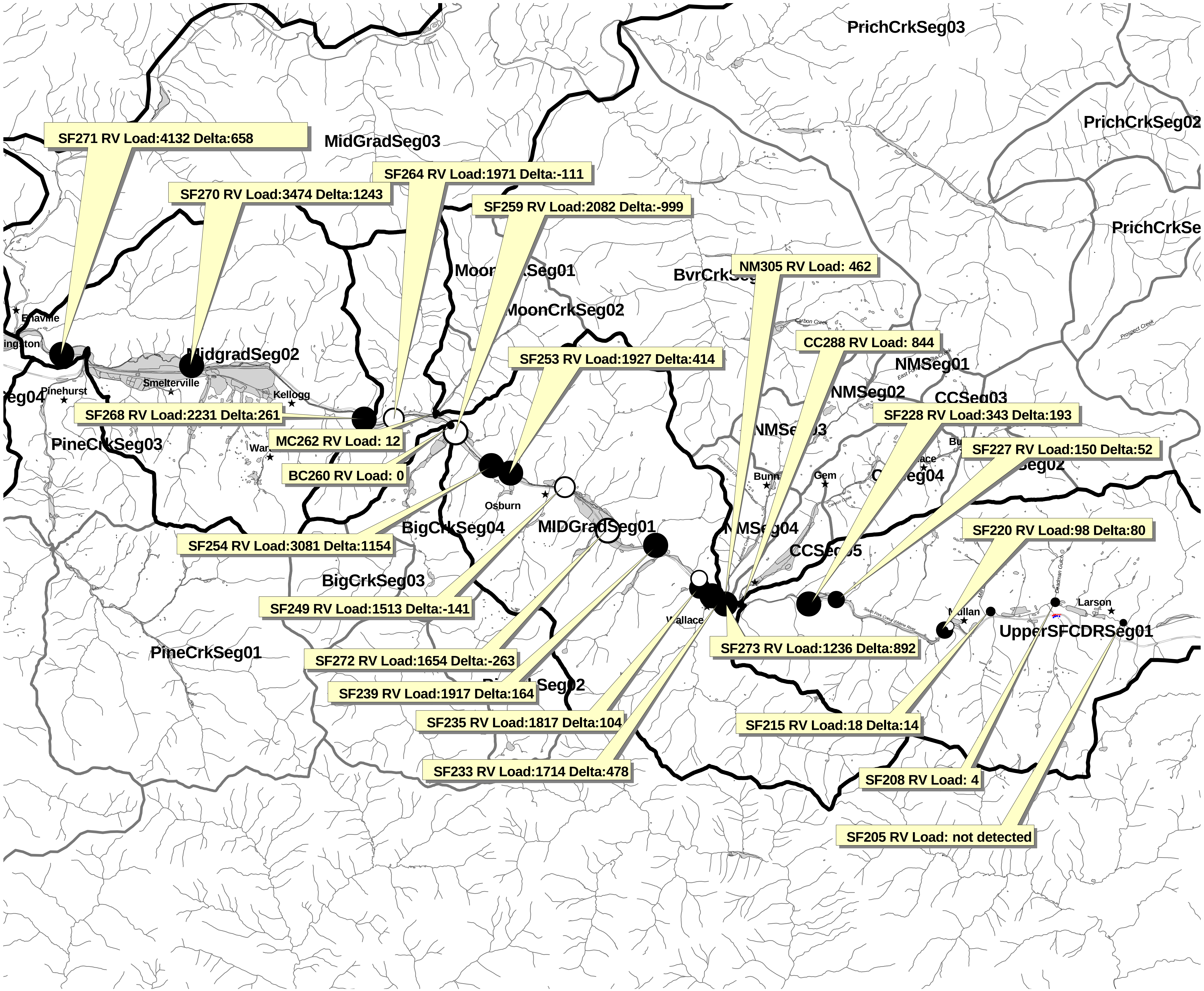

Figure 4.2-10
Upper South Fork Coeur d' Alene River Watershed
Dissolved Zinc Mass Loading
Sampling Results May 1998

LEGEND

Sampling Location — SF271 RV Load: 4182 Delta: 968 — Values are lbs/day

Location Type:

RV: River/Stream Sampling Location

(-) Neg.	(+) Pos.	Delta of Mass Load Compared to Preceeding Upstream Sampling Location
		Delta Range: 0 - 0.9
		Delta Range: 1 - 20
		Delta Range: 20 - 40
		Delta Range: 40 - 100
		Delta Range: 100 - 150
		Delta Range: > 150

- Stream
- Interstate 90
- City
- River/Lake
- Midgrad/USFCDR Watershed
- River Segment
- Source Area

Location Map

NOTES

1) Base map coverages obtained from the Coeur d' Alene Tribe, URS Greiner Inc., CH2M HILL, and the Burueau of Land Management.

SCALE 1: 160,000

0 3 Miles

N

027-RI-C0-102Q
Coeur d' Alene Basin RI/FS
RI Report

EPA REGION 10

Document Control 4162500.6615.05a
Generation 1
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incremental_watershed_usfcdr_7-24.apr
V: SF-may98-zinc
L: Final RI SF-may98-zinc
7/24/2001

This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: July 24, 2001

Table 4.1-1
Potential Source Areas Within Upper South Fork - segment UpperSFCDRSeg01

Source Area Name	Source ID	Area (Acres)	Source Description	No. Samples By Matrix Type		Metals > 1X	Metals > 10X	Metals > 100X
ALICE MINE	MUL008	1.34	Floodplain waste rock	SW	1	SWD: Sb-1 SWT: Fe-1, Mn-1, Sb-1		
ALMA MINE	MUL048	0.89	Floodplain waste rock					
AMERICAN COMMANDER NO. 1	CH1615	0.28	Upland waste rock					
AMERICAN COMMANDER NO. 2	CH1616	0.66	Floodplain Waste Rock (Above Cataldo No.& So.Fork)					
AMERICAN COMMANDER NO.1	MUL036	0.28	Upland waste rock					
AMERICAN COMMANDER NO.2	MUL033	0.66	Floodplain waste rock					
ARGENTA MINE	CH1535	0.30	Upland waste rock					
ARGENTA MINE	MUL075	0.30	Upland waste rock					
ATLAS MINE	CH1580	8.14	Mine Workings/Water, Seeps, Springs and Leachate					
ATLAS MINE	MUL071	8.14	Adit drainage Floodplain waste rock	SW	1	SWD: Cd-1, Pb-1, Zn-1 SWT: Cd-1, Zn-1		
ATLAS MINE (CARBONATE HILL)	CH1541	2.06	Upland waste rock					
ATLAS MINE (CARBONATE HILL)	MUL073	2.06	Upland waste rock					
ATLAS MINE ROCK DUMP	MUL129	1.11	Floodplain waste rock					
BANNER MINE NO. 01	MUL069	0.22	Upland waste rock					
BANNER MINE NO. 02	MUL120	0.34	Floodplain waste rock					
BANNER MINE: NO. 01	CH1531	0.22	Mine Workings/Water, Seeps, Springs and Leachate					
BANNER MINE: NO. 02	CH1530	0.34	Floodplain Waste Rock (Above Cataldo No.& So.Fork)					
BEACON LIGHT	CH1661	3.63	Floodplain Waste Rock (Above Cataldo No.& So.Fork)					
BEACON LIGHT	LOK017	3.63	Adit drainage Floodplain waste rock					
BITTERROOT PROSPECT	CH1525	0.94	Mine Workings/Water, Seeps, Springs and Leachate					
BITTERROOT PROSPECT	MUL066	0.94	Upland waste rock					
BLUE JAY MINE	CH1527	0.35	Upland waste rock					
BLUE JAY MINE	MUL061	0.35	Upland waste rock					
BORAX MINE	LOK033	0.21						
BOULDER CK QUARRY	CH1669	1.34	Upland waste rock					
BOULDER CK QUARRY	MUL067	1.34	Upland waste rock					
BUILLION MINE	LOK038	0.31						

Table 4.1-1
Potential Source Areas Within Upper South Fork - segment UpperSFCDRSeg01

Source Area Name	Source ID	Area (Acres)	Source Description	No. Samples By Matrix Type	Metals > 1X	Metals > 10X	Metals > 100X
BULL FROG MINE	CH1656	0.29	Mine Workings/Water, Seeps, Springs and Leachate				
BULL FROG MINE	THO020	0.29	Floodplain waste rock				
BUTCHER MINE	MUL017	0.54	Upland waste rock				
BUTTE & COEUR D ALENE (IDAHO SILVER)	CH1581	0.27	Upland waste rock				
BUTTE & COEUR D ALENE (IDAHO SILVER)	LOK007	0.27	Upland waste rock (erosion potential)				
BUTTE AND COEUR D ALENE MINE	CH1644	0.79	Mine Workings/Water, Seeps, Springs and Leachate				
BUTTE AND COEUR D ALENE MINE	MUL057	0.79	Upland waste rock (erosion potential)				
CARNEY NO. 1	CH1540	0.34	Mine Workings/Water, Seeps, Springs and Leachate				
CARNEY NO. 2	CH1539	1.14	Mine Workings/Water, Seeps, Springs and Leachate				
CARNEY NO. 3	CH1538	0.89	Upland waste rock				
CARNEY NO.1	MUL080	0.34	Upland waste rock				
CARNEY NO.2	MUL078	1.14	Upland waste rock				
CARNEY NO.3	MUL079	0.89	Upland waste rock				
CENTRAL PROSPECT	CH1529	0.36	Mine Workings/Water, Seeps, Springs and Leachate				
CENTRAL PROSPECT	MUL068	0.36	Upland waste rock				
CHAMPION MINE	MUL096	0.66					
CINCINNATI MINE	CH1617	0.34	Mine Workings/Water, Seeps, Springs and Leachate				
CINCINNATI MINE	MUL031	0.34	Upland waste rock (erosion potential)				
COEUR D ALENE SILVER LEAD MINING CO.	LOK045	0.37	Upland waste rock				
COMET MINE	MUL100	0.69					
COPPER CHIEF MINE	LOK043	0.27					
COPPER KING MINE	CH1632	1.33	Floodplain Waste Rock (Above Cataldo No.& So.Fork)				
COPPER KING MINE	MUL052	1.33	Adit drainage Floodplain waste rock	SL 1 SW 2	SST: Pb-1, Zn-1 SWD: Cu-1, Pb-1 SWT: Cd-1, Fe-1, Mn-1, Zn-1	SST: Cu-1 SWT: Cu-1, Pb-1	
COPPER MOUNTAIN MINE	LOK029	0.76					
COPPER PLATE MINE	MUL049	0.30	Upland waste rock (erosion potential)				
COPPER PLATE MINE: ADIT NO. 01	CH1666	0.30	Mine Workings/Water, Seeps, Springs and Leachate				

Table 4.1-1
Potential Source Areas Within Upper South Fork - segment UpperSFCDRSeg01

Source Area Name	Source ID	Area (Acres)	Source Description	No. Samples By Matrix Type		Metals > 1X	Metals > 10X	Metals > 100X
COPPER PLATE MINE: ADIT NO. 02	CH1667	0.30	Mine Workings/Water, Seeps, Springs and Leachate					
COPPER PLATE MINE: ADIT NO. 03	CH1633	0.30	Mine Workings/Water, Seeps, Springs and Leachate					
COPPER QUEEN MINE	CH1537	0.64	Floodplain Waste Rock (Above Cataldo No.& So.Fork)					
COPPER QUEEN MINE	MUL083	0.64	Floodplain waste rock					
COUGHLIN MINE	CH1650	0.35	Mine Workings/Water, Seeps, Springs and Leachate					
COUGHLIN MINE	MUL056	0.35	Upland waste rock (erosion potential)					
DAISY GULCH OLD LANDFILL	LOK051	1.91	Floodplain artificial fill					
DAISY GULCH TAILINGS POND	CH1583	2.73	Upland tailings					
DAISY GULCH TAILINGS POND	LOK050	2.73	Upland tailings					
DEADMAN GULCH IMPACTED RIPARIAN	MUL150	3.02	Floodplain sediments					
DEADMAN GULCH IMPACTED RIPARIAN	MUL153	1.52	Floodplain sediments	SL	1	SST: Pb-1, Zn-1		
DIANE MINE	LOK034	0.20						
EAST HECLA GROUP	BUR137	0.32	Upland waste rock					
EAST HECLA GROUP	CH1634	0.32	Upland waste rock					
EMMA MAY MINE	LOK032	0.22						
FANNY GREMM MINE	CH1618	1.30	Floodplain Waste Rock (Above Cataldo No.& So.Fork)					
FANNY GREMM MINE	MUL023	1.30	Adit drainage Floodplain waste rock					
FOURTH OF JULY MINE	LOK039	2.82						
GEM STATE MINE	CH1584	0.21	Floodplain Waste Rock (Above Cataldo No.& So.Fork)					
GEM STATE MINE	MUL063	0.21	Floodplain waste rock					
GOLCONDA MILLSITE	MUL002	5.04	Upland tailings					
GOLCONDA MINESITE	CH1585	3.14	Floodplain Waste Rock (Above Cataldo No.& So.Fork)					
GOLCONDA MINESITE	MUL001	3.14	Adit drainage Floodplain waste rock	SW	2	SWT: Cu-1, Fe-2, Pb-2	SWD: Mn-2 SWT: Mn-2	
GOLCONDA TAILINGS	WAL077	6.71	Floodplain sediments Floodplain tailings Groundwater					
GOLD HUNTER COLLAPSED TUNNEL	CH1627	3.72	Upland waste rock					

Table 4.1-1
Potential Source Areas Within Upper South Fork - segment UpperSFCDRSeg01

Source Area Name	Source ID	Area (Acres)	Source Description	No. Samples By Matrix Type		Metals > 1X	Metals > 10X	Metals > 100X
GOLD HUNTER COLLAPSED TUNNEL	MUL041	3.72	Upland waste rock					
GOLD HUNTER NO. 5	CH1628	0.58	Floodplain Waste Rock (Above Cataldo No.& So.Fork)					
GOLD HUNTER NO. 5	MUL042	0.58	Floodplain waste rock					
GOLD HUNTER NO. 6	CH1586	2.77	Floodplain Waste Rock (Above Cataldo No.& So.Fork)					
GOLD HUNTER NO. 6	MUL038	2.77	Floodplain tailings Floodplain waste rock					
GRANADA MINE	CH1596	0.34	Mine Workings/Water, Seeps, Springs and Leachate					
GRANADA MINE	WAL013	0.34	Floodplain waste rock					
GROUSE GULCH IMPACTED RIPARIAN	MUL142	6.86	Floodplain sediments	SW	1	SWD: Mn-1 SWT: Cd-1, Mn-1, Pb-1	SWD: Cd-1, Pb-1, Zn-1 SWT: Zn-1	
GROUSE MINE	CH1609	0.33	Mine Workings/Water, Seeps, Springs and Leachate					
GROUSE MINE	MUL014	0.33	Adit drainage Upland waste rock (erosion potential)	SW	1	SWD: Cd-1, Zn-1 SWT: Pb-1, Zn-1	SWD: Pb-1	
HASH HOUSE MINE	CH1587	0.14	Floodplain Waste Rock (Above Cataldo No.& So.Fork)					
HASH HOUSE MINE	LOK010	0.14	Floodplain waste rock					
HOMESTAKE MINE	CH1635	1.15	Mine Workings/Water, Seeps, Springs and Leachate					
HOMESTAKE MINE	MUL045	1.15	Floodplain waste rock					
HORST-POWELL MINE	MUL102	0.40						
HUNTER-SNOWSTORM LODE/UNNAMED PROSP	CH1588	0.46	Upland waste rock					
HUNTER-SNOWSTORM LODE/UNNAMED PROSP	LOK028	0.46	Adit drainage Upland waste rock	SW	1		SWD: Cd-1	
IDAHO COPPER	CH1534	0.46	Upland waste rock					
IDAHO COPPER	MUL074	0.46	Upland waste rock					
IDAHO MONTANA MINING COMPANY	THO021	0.30	Upland waste rock					
IDAHO MONTANA SILVER	LOK041	0.94	Upland waste rock					
IDAHO SILVER NO. 2	LOK008	0.38	Floodplain waste rock					
IDAHO SILVER NO.1	LOK026	0.34	Upland waste rock					
IDAHO SILVER: NO. 02	CH1590	0.34	Floodplain Waste Rock (Above Cataldo No.& So.Fork)					
INDEPENDENCE MINE	CH1619	1.21	Floodplain Waste Rock (Above Cataldo No.& So.Fork)					

Table 4.1-1
Potential Source Areas Within Upper South Fork - segment UpperSFCDRSeg01

Source Area Name	Source ID	Area (Acres)	Source Description	No. Samples By Matrix Type		Metals > 1X	Metals > 10X	Metals > 100X
INDEPENDENCE MINE	MUL021	1.21	Floodplain waste rock					
IRON SPAR MINE	LOK046	0.34						
IVANHOE MINE	CH1610	0.15	Upland waste rock					
IVANHOE MINE	MUL011	0.15	Upland waste rock					
LESLIE MINE	LOK030	0.80						
LEWIS & CLARK GROUP	CH1659	0.76	Upland waste rock					
LEWIS & CLARK GROUP	LOK044	0.76	Upland waste rock					
LIQUIDATOR (EAST HECLA GROUP)	BUR136	0.30	Upland waste rock					
LOST BOOZE MINE	CH1664	0.82	Upland waste rock					
LOST BOOZE MINE	LOK016	0.82	Upland waste rock					
LOTTIE L. MINE	CH1637	0.23	Floodplain Waste Rock (Above Cataldo No.& So.Fork)					
LOTTIE L. MINE	MUL047	0.23	Floodplain waste rock					
LOWER GIANT MINE	CH1591	0.77	Upland waste rock					
LOWER GIANT MINE	MUL072	0.77	Adit drainage Upland waste rock	SW	1	SWD: Cu-1 SWT: Cd-1, Mn-1	SWD: Mn-1	
LUCKY BOY NO. 1	CH1668	0.26	Mine Workings/Water, Seeps, Springs and Leachate					
LUCKY BOY NO. 1	LOK006	0.26	Floodplain waste rock					
LUCKY BOY NO. 2	CH1651	0.18	Mine Workings/Water, Seeps, Springs and Leachate					
LUCKY BOY NO. 2	LOK005	0.18	Upland waste rock (erosion potential)					
LUCKY CALUMET NO. 1	CH1652	1.29	Upland waste rock					
LUCKY CALUMET NO. 1	LOK001	1.29	Upland waste rock (erosion potential)					
LUCKY CALUMET NO. 2	CH1653	1.27	Mine Workings/Water, Seeps, Springs and Leachate					
LUCKY CALUMET NO. 2	LOK002	1.27	Upland waste rock (erosion potential)	SW	1			
LUCKY FRIDAY MINE COMPLEX	CH1524	29.00	Mine Workings/Water, Seeps, Springs and Leachate					
LUCKY FRIDAY MINE COMPLEX	CH1670	29.00	Floodplain Waste Rock (Above Cataldo No.& So.Fork)					
LUCKY FRIDAY MINE COMPLEX	MUL039	29.00	Upland tailings					
LUCKY FRIDAY ROCK DUMPS	LOK049	3.20	Floodplain waste rock					
LUCKY FRIDAY TAILINGS POND No. 2	MUL037	10.05	Floodplain sediments Floodplain sediments (underlying tailings pond) Floodplain tailings Groundwater					

Table 4.1-1
Potential Source Areas Within Upper South Fork - segment UpperSFCDRSeg01

Source Area Name	Source ID	Area (Acres)	Source Description	No. Samples By Matrix Type	Metals > 1X	Metals > 10X	Metals > 100X
LUCKY FRIDAY TAILINGS POND No. 3	MUL020	11.03	Floodplain sediments (underlying tailings pond) Floodplain tailings Groundwater				
LUCKY FRIDAY TAILINGS POND No.1	MUL058	34.72	Floodplain sediments Floodplain sediments (underlying tailings pond) Floodplain tailings Groundwater				
LUCKY SWEDE MINE	LOK040	0.73					
MARY D CLAIM WORKINGS	WAL076	1.70	Floodplain waste rock				
MAYFLOWER MINE	CH1597	2.74	Mine Workings/Water, Seeps, Springs and Leachate				
MAYFLOWER MINE	MUL003	2.74	Upland waste rock				
MILITARY MINE	THO019	0.34	Upland waste rock				
MILL CK IMPACTED RIPARIAN No. 1	MUL149	1.13	Floodplain sediments				
MILL CK IMPACTED RIPARIAN No. 2	MUL145	0.84	Floodplain sediments				
MILL CK IMPACTED RIPARIAN No. 3	MUL141	1.93	Floodplain sediments				
MISSOULA MINE	CH1639	0.94	Mine Workings/Water, Seeps, Springs and Leachate				
MISSOULA MINE	MUL103	0.94	Floodplain waste rock	SL 1 SW 1	SST: Cu-1 SWD: Cd-1, Cu-1 SWT: Cd-1	SWT: Cu-1	
MOE MINE	MUL065	0.31	Floodplain waste rock				
MORNING NO. 1 & NO. 2	CH1646	1.02	Upland waste rock				
MORNING NO. 3	CH1647	1.31	Upland waste rock				
MORNING NO. 4	CH1648	0.99	Upland waste rock				
MORNING NO. 5	CH1649	4.25	Floodplain Waste Rock (Above Cataldo No.& So.Fork)				
MORNING NO.1 & NO.2	MUL026	1.02	Upland waste rock				
MORNING NO.3	MUL146	1.31	Upland waste rock (erosion potential)				
MORNING NO.4	MUL027	0.99	Adit drainage Upland waste rock	SW 1	SWD: Ag-1, Cu-1 SWT: Cd-1, Cu-1, Pb-1	SWD: Cd-1, Mn-1, Pb-1, Zn-1 SWT: Mn-1, Zn-1	
MORNING NO.4 ADJACENT DISTURBANCE	MUL148	0.67	Upland waste rock				
MORNING NO.5	MUL028	4.25	Adit drainage Floodplain waste rock	SW 1	SWT: Cd-1, Mn-1	SWD: Cd-1, Mn-1, Zn-1 SWT: Zn-1	

Table 4.1-1
Potential Source Areas Within Upper South Fork - segment UpperSFCDRSeg01

Source Area Name	Source ID	Area (Acres)	Source Description	No. Samples By Matrix Type	Metals > 1X	Metals > 10X	Metals > 100X
MORNING NO.6	MUL019	17.65	Adit drainage Buildings & structures Floodplain tailings Floodplain waste rock Seep	SW 113	SWD: Cd-5, Pb-2, Zn-3 SWT: Cd-48, Fe-1, Pb-101, Zn-97	SWD: Mn-1 SWT: Mn-4, Pb-2, Zn-11	SWD: Mn-1
MULLAN GRAVEL PIT	MUL130	1.77	Upland waste rock				
MULLAN GROUP	CH1640	0.37	Upland waste rock				
MULLAN GROUP	MUL050	0.37	Upland waste rock				
MULLAN METALS MINE	MUL018	0.60	Floodplain waste rock				
NATIONAL LEAD MINING CO.	MUL010	0.32	Upland waste rock				
NATIONAL MILLSITE	MUL131	1.40	Upland tailings				
NATIONAL MILLSITE ADJACENT TAILINGS	MUL132	0.37	Upland tailings				
NATIONAL MINE	CH1641	3.16	Upland waste rock				
NATIONAL MINE	MUL053	3.16	Adit drainage Upland waste rock (erosion potential)				
NEW YORK MINE	CH1592	0.38	Upland waste rock				
NEW YORK MINE	MUL155	0.38	Upland waste rock				
NONPAREIL GROUP	CH1533	0.24	Upland waste rock				
NONPAREIL GROUP	MUL077	0.24	Upland waste rock				
NORANDA (SUPERIOR SILVER) MINE	MUL076	0.35	Upland waste rock				
NORTH FRANKLIN MINE	CH1620	0.85	Floodplain Waste Rock (Above Cataldo No.& So.Fork)				
NORTH FRANKLIN MINE	MUL029	0.85	Floodplain waste rock				
PANDORA MINE	CH1660	0.48	Mine Workings/Water, Seeps, Springs and Leachate				
PANDORA MINE	LOK014	0.48	Upland waste rock				
PEACOCK COPPER MINE	LOK037	0.93					
PILOT MINE	CH1642	1.20	Floodplain Waste Rock (Above Cataldo No.& So.Fork)				
PILOT MINE	MUL051	1.20	Floodplain waste rock				
PLYMOUTH NO. 4	MUL040	0.19	Upland waste rock				
PORTAL CLAIM TUNNEL	CH1526	0.17	Mine Workings/Water, Seeps, Springs and Leachate				
PORTAL CLAIM TUNNEL	MUL156	0.17	Upland waste rock				
PRINCETON MAGNA MINE	CH1665	0.66	Upland waste rock				

Table 4.1-1
Potential Source Areas Within Upper South Fork - segment UpperSFCDRSeg01

Source Area Name	Source ID	Area (Acres)	Source Description	No. Samples By Matrix Type		Metals > 1X	Metals > 10X	Metals > 100X
PRINCETON MAGNA MINE	LOK019	0.66	Adit drainage Upland waste rock	SW	1	SWT: Cu-1, Fe-1		
PRINCETON MINE	CH1546	0.54	Mine Workings/Water, Seeps, Springs and Leachate					
PRINCETON MINE	LOK020	0.54	Upland waste rock	SW	1	SWD: Cu-1 SWT: Cd-1		
REINDEER QUEEN MINE	CH1536	0.76	Floodplain Waste Rock (Above Cataldo No.& So.Fork)					
REINDEER QUEEN MINE	MUL081	0.76	Adit drainage Floodplain waste rock	SL SW	1 2	SST: As-1, Fe-1, Mn-1 SWD: Cu-1 SWT: Cd-1	SST: Cu-1	
ROCK CREEK MINE	CH1545	0.21	Mine Workings/Water, Seeps, Springs and Leachate					
ROCK CREEK MINE	MUL060	0.21	Floodplain waste rock					
ROCK CREEK MINE ROCK DUMP	MUL059	0.94	Floodplain waste rock	SW	2			
SCENIC SILVER GROUP	MUL101	0.30						
SF CDA RIVER IMPACTED FLOODPLAIN: NO. 1	WAL038	149.00	Floodplain sediments Groundwater	SD SW	7 50	SDT: Ag-2, As-3, Cd-6, Cu-7, Fe-2, Hg-3, Mn-5, Sb-1, Zn-6 SWD: Cd-35, Mn-3, Pb-28, Zn-41 SWT: Cd-2, Cu-5, Fe-1, Mn-5, Pb-9, Sb-1, Zn-48	SDT: Cd-1, Hg-1, Mn-1, Pb-6, Zn-1 SWD: Cd-2, Pb-1, Zn-1 SWT: Zn-2	SDT: Pb-1
SHAMROCK MINE	LOK035	0.22						
SHOSHONE SILVER MINE	MUL097	1.01						
SILDEX MINE	LOK031	2.55						
SILVER CABLE MINE	CH1544	1.32	Mine Workings/Water, Seeps, Springs and Leachate					
SILVER CABLE MINE	LOK024	1.32	Adit drainage Upland waste rock					
SILVER CLIFF	CH1543	0.56	Upland waste rock					
SILVER CLIFF	LOK018	0.56	Upland waste rock	SW	1	SWD: Cd-1, Cu-1 SWT: Cd-1		
SILVER REEF MINE	CH1630	0.73	Mine Workings/Water, Seeps, Springs and Leachate					
SILVER REEF MINE	MUL043	0.73	Floodplain waste rock					
SILVER SHADOW GROUP	MUL099	2.11						
SILVER SHAFT	MUL009	0.25	Upland waste rock (erosion potential)					
SNOWSHOE NO. 1	CH1654	0.24	Upland waste rock					
SNOWSHOE NO. 1	LOK003	0.24	Upland waste rock					

Table 4.1-1
Potential Source Areas Within Upper South Fork - segment UpperSFCDRSeg01

Source Area Name	Source ID	Area (Acres)	Source Description	No. Samples By Matrix Type		Metals > 1X	Metals > 10X	Metals > 100X
SNOWSHOE NO. 2	CH1655	0.71	Floodplain Waste Rock (Above Cataldo No.& So.Fork)					
SNOWSHOE NO. 2	LOK004	0.71	Adit drainage Floodplain waste rock	SW	1	SWD: Cd-1 SWT: Cd-1		
SNOWSTORM APEX	LOK048	0.27	Floodplain waste rock					
SNOWSTORM NO. 1	CH1593	1.28	Mine Workings/Water, Seeps, Springs and Leachate					
SNOWSTORM NO. 1	LOK013	1.28	Upland waste rock					
SNOWSTORM NO. 2	LOK012	1.45	Upland waste rock					
SNOWSTORM NO. 3	CH1577	1.81	Mine Workings/Water, Seeps, Springs and Leachate					
SNOWSTORM NO. 3	LOK011	1.81	Adit drainage Floodplain waste rock	SW	2	SWD: Mn-1, Sb-1 SWT: Sb-1	SWD: Cu-1	SWD: Cu-1 SWT: Cu-2
SNOWSTORM NO. 4	CH1579	0.92	Mine Workings/Water, Seeps, Springs and Leachate					
SNOWSTORM NO. 4	LOK009	0.92	Floodplain waste rock					
SQUARE DEAL MINE	CH1598	0.73	Floodplain Waste Rock (Above Cataldo No.& So.Fork)					
SQUARE DEAL MINE	MUL006	0.73	Floodplain waste rock	SW	2			
STAR 1200 LEVEL	CH1613	6.75	Floodplain Waste Rock (Above Cataldo No.& So.Fork)					
STAR 1200 LEVEL	MUL012	6.75	Adit drainage Floodplain waste rock	SW	2	SWT: Cu-1	SWD: Mn-1 SWT: Cd-1, Mn-1, Pb-1	SWD: Cd-1, Pb-1, Zn-1 SWT: Zn-1
STEPHENS PEAK MINES, INC.	MUL092	7.53						
SUMNER MINE	MUL098	0.41						
SUNSHINE PREMIER MINE	CH1621	0.36	Mine Workings/Water, Seeps, Springs and Leachate					
SUNSHINE PREMIER MINE	MUL022	0.36	Upland waste rock (erosion potential)					
TUCKER GROUP	CH1542	2.26	Upland waste rock					
TUCKER GROUP	LOK047	2.26	Upland waste rock					
UNIDENTIFIED DISTURBANCE	LOK015	0.12	Upland waste rock					
UNITED LEAD ZINC MINE	CH1599	0.82	Mine Workings/Water, Seeps, Springs and Leachate					
UNITED LEAD ZINC MINE	MUL004	0.82	Floodplain waste rock					
UNNAMED ADIT	LOK027	0.19	Upland waste rock					
UNNAMED ADIT	LOK052	0.31	Upland waste rock					
UNNAMED ADIT	LOK053	0.31	Upland waste rock (erosion potential)					
UNNAMED ADIT	LOK054	0.13	Upland waste rock					

Table 4.1-1
Potential Source Areas Within Upper South Fork - segment UpperSFCDRSeg01

Source Area Name	Source ID	Area (Acres)	Source Description	No. Samples By Matrix Type		Metals > 1X	Metals > 10X	Metals > 100X
UNNAMED ADIT	MUL016	0.55	Upland waste rock					
UNNAMED ADIT	MUL054	0.94	Adit drainage Upland waste rock (erosion potential)	SW	1	SWD: Cu-1 SWT: Cd-1		
UNNAMED ADIT	MUL062	0.25	Upland waste rock					
UNNAMED ADIT	MUL064	0.56	Upland waste rock					
UNNAMED ADIT	MUL082	0.25	Upland waste rock					
UNNAMED ADIT	MUL104	0.20						
UNNAMED ADIT	MUL114	0.22	Upland waste rock					
UNNAMED ADIT	MUL115	0.24	Upland waste rock					
UNNAMED ADIT	MUL116	0.18	Upland waste rock					
UNNAMED ADIT	MUL117	0.28	Upland waste rock					
UNNAMED ADIT	MUL119	0.28	Upland waste rock (erosion potential)	SL	1	SST: As-1, Fe-1, Mn-1		SST: Pb-1
UNNAMED ADIT	MUL121	0.16	Upland waste rock					
UNNAMED ADIT	MUL122	0.21	Upland waste rock					
UNNAMED ADIT	MUL124	0.18	Upland waste rock					
UNNAMED ADIT	MUL126	0.22	Upland waste rock					
UNNAMED ADIT	MUL127	0.23	Upland waste rock					
UNNAMED ADIT	MUL128	0.19	Upland waste rock					
UNNAMED ADIT	MUL133	0.25	Upland waste rock					
UNNAMED ADIT	MUL134	0.58	Upland waste rock					
UNNAMED ADIT	MUL135	0.18	Upland waste rock (erosion potential)					
UNNAMED ADIT	MUL136	0.12	Upland waste rock (erosion potential)					
UNNAMED ADIT	MUL137	0.36	Upland waste rock					
UNNAMED ADIT	MUL139	0.24	Upland waste rock (erosion potential)					
UNNAMED ADIT	MUL140	0.17	Upland waste rock					
UNNAMED ADIT	MUL143	0.36	Upland waste rock					
UNNAMED ADIT	MUL144	0.24	Upland waste rock					
UNNAMED ADIT	MUL147	0.19	Upland waste rock					
UNNAMED ADIT	MUL151	0.25	Upland waste rock					
UNNAMED ADIT	MUL152	0.17	Upland waste rock					
UNNAMED ADIT	MUL154	1.74	Upland waste rock					
UNNAMED ADIT	MUL157	0.11	Upland waste rock					
UNNAMED PROSPECT	CH1643	0.35	Mine Workings/Water, Seeps, Springs and Leachate					
UNNAMED PROSPECT	LOK021	1.14	Upland waste rock					

Table 4.1-1
Potential Source Areas Within Upper South Fork - segment UpperSFCDRSeg01

Source Area Name	Source ID	Area (Acres)	Source Description	No. Samples By Matrix Type	Metals > 1X	Metals > 10X	Metals > 100X
UNNAMED PROSPECT	LOK022	1.47	Upland waste rock				
UNNAMED PROSPECT	LOK025	0.38	Upland waste rock				
UNNAMED PROSPECT	MUL032	0.34	Upland waste rock				
UNNAMED PROSPECT	MUL046	0.35	Upland waste rock				
UNNAMED PROSPECT	MUL084	1.13	Upland waste rock				
UNNAMED PROSPECT	MUL089	0.70					
UNNAMED PROSPECT	MUL090	0.28					
UNNAMED PROSPECT	MUL091	0.42					
UNNAMED PROSPECT	MUL093	0.48					
UNNAMED PROSPECT	MUL094	0.38					
UNNAMED PROSPECT	MUL095	0.54					
UNNAMED PROSPECT	MUL105	0.21					
UNNAMED PROSPECT	MUL106	0.32					
UNNAMED PROSPECT	MUL107	0.13	Upland waste rock				
UNNAMED PROSPECT	MUL108	0.14	Upland waste rock				
UNNAMED PROSPECT	MUL109	0.17	Upland waste rock				
UNNAMED PROSPECT	MUL110	0.14	Upland waste rock				
UNNAMED PROSPECT	MUL111	0.19	Upland waste rock				
UNNAMED PROSPECT	MUL112	0.18	Upland waste rock				
UNNAMED PROSPECT	MUL113	0.21	Upland waste rock				
UNNAMED PROSPECT	MUL123	0.15	Upland waste rock				
UNNAMED PROSPECT	MUL125	0.25	Upland waste rock				
UNNAMED PROSPECT	MUL138	0.81	Upland waste rock				
UPPER GIANT PROSPECT	CH1528	0.32	Upland waste rock				
UPPER GIANT PROSPECT	MUL118	0.32	Upland waste rock				
VINDICATOR MINE	CH1594	2.61	Mine Workings/Water, Seeps, Springs and Leachate				
VINDICATOR MINE	MUL055	2.61	Upland waste rock				
WALL STREET MINE	CH1622	0.36	Mine Workings/Water, Seeps, Springs and Leachate				
WALL STREET MINE	MUL030	0.36	Floodplain waste rock				
WE LIKE MINE	CH1614	0.53	Upland waste rock				
WE LIKE MINE	MUL013	0.53	Upland waste rock (erosion potential)				
WEST FEDERAL GROUP	CH1600	0.34	Upland waste rock				
WEST FEDERAL GROUP	MUL005	0.34	Upland waste rock				

Table 4.1-1
Potential Source Areas Within Upper South Fork - segment UpperSFCDRSeg01

Source Area Name	Source ID	Area (Acres)	Source Description	No. Samples By Matrix Type	Metals > 1X	Metals > 10X	Metals > 100X
WEST STAR MINE	CH1400	9.34	Upland waste rock				
WEST STAR MINE	MUL015	9.34	Upland waste rock (erosion potential)				
WEST STAR MINE: ADIT NO. 01	CH1645	9.34	Mine Workings/Water, Seeps, Springs and Leachate				
WEST STAR MINE: ADIT NO. 02	CH1399	9.34	Mine Workings/Water, Seeps, Springs and Leachate				
WESTERN SILVER LEAD	CH1595	0.29	Upland waste rock				
WESTERN SILVER LEAD	WAL068	0.29	Upland waste rock				
WONDER MINE	MUL007	0.95	Upland waste rock (erosion potential)				
WONDERFUL MINE	LOK036	0.32					
YOLANDE PROSPECT No. 1	MUL035	0.30	Upland waste rock				
YOLANDE PROSPECT No. 2	MUL034	0.44	Upland waste rock				
YOLANDE PROSPECT: NO. 01	CH1623	0.30	Upland waste rock				
YOLANDE PROSPECT: NO. 02	CH1624	0.44	Mine Workings/Water, Seeps, Springs and Leachate				
YOU LIKE MINE	CH1625	1.12	Upland waste rock				
YOU LIKE MINE	MUL024	1.12	Adit drainage Upland waste rock				
YOU LIKE MINE UPPER WORKINGS	CH1626	1.01	Upland waste rock				
YOU LIKE MINE UPPER WORKINGS	MUL025	1.01	Upland waste rock				

Matrix Types

DR: Debris/Rubble
GW: Groundwater
RK: Rock/Cobbles/Gravel
SB: Subsurface Soil
SD: Sediment
SL: Soil
SS: Surface Soil
SW: Surface Water

Matrix Groupings

GWD: Groundwater - Dissolved Metals
GWT: Groundwater - Total Metals
SBT: Subsurface Soil
SDT: Sediment
SST: Surface Soil
SWD: Surface Water - Dissolved Metals
SWT: Surface Water - Total Metals

Analytes

Ag: Silver
As: Arsenic
Cd: Cadmium
Cu: Copper
Fe: Iron
Hg: Mercury
Mn: Manganese
Pb: Lead
Sb: Antimony
Zn: Zinc

Table 4.1.2-1
Adit and Seep Data Summary

BLM ID	Source Name	Average Discharge (cfs)	Maximum Discharge (cfs)	Average Total Zinc Concentration (μg/l)	Average Total Zinc Load (lbs/day)
Adits					
MUL012	Star 1200 Level	0.43	0.70	7,010	16
MUL019	Morning No. 6	1.18	1.85	167	1.1
MUL014	Grouse Mine	1.82	1.82	84	0.82
MUL028	Morning No. 5	0.0547	0.088	1,616	0.48
LOK011	Snowstrom No. 3	5.74	12	12	0.37
MUL027	Morning No. 4	0.0152	0.0152	950	0.078
MUL053	National Mine	0.174	0.174	35	0.033
MUL052	Copper King	0.084	0.112	40	0.018
MUL001	Golconda	0.0304	0.0388	18	0.0029
MUL054	Unnamed adit	0.007	0.007	51	0.0019
LOK004	Snowshoe No. 2	0.112	0.112	3	0.0018
MUL072	Lower Giant	0.0223	0.0223	3	0.00036
MUL081	Reindeer Queen	0.0075	0.011	8	0.00032
LOK017	Beacon Light	0.0045	0.0045	3	0.000073
LOK019	Princeton Magna	0.0003	0.0003	21	0.000034
LOK024	Silver Cable	No data	No data	1,100	No discharge data
LOK028	Hunter-Snowstorm Lode	No data	No data	10	No discharge data
MUL023	Fanny Gremm	No data	No data	40	No discharge data
MUL024	You Like	No data	No data	2,310	No discharge data
MUL071	Atlas	No data	No data	201	No discharge data
LOK002	Lucky Calumet No. 2	No data	No data	No data	No data
LOK008	Idaho Silver No. 2	No data	No data	No data	No data
LOK014	Pandora	No data	No data	No data	No data
MUL006	Square Deal	No data	No data	No data	No data
MUL008	Alice	No data	No data	No data	No data
MUL013	We Like	No data	No data	No data	No data
MUL103	Missoula	No data	No data	No data	No data
Seeps					
MUL019	Morning No. 6 waste rock	1.71	2.37	116	1.1

Notes:
Data compiled from the Restorations Alternative Plan (Gearheart et al. 1999). See Appendix J.
cfs - cubic feet per second
μg/l - micrograms per liter
lbs/day - pounds per day

Table 4.2-1
Mass Loading Upper South Fork

Location	Sample No.	Upper SFCDR Segment	Sample Type	Sample Date	Flow (CFS)	Flow Delta	Total Lead			Dissolved Zinc		
							Conc. (µg/l)	Load (lbs/day)	Delta[a] (lbs/day)	Conc. (µg/l)	Load (lbs/day)	Delta[a] (lbs/day)
SF220	172048	1	RV	15-May-91	276.3	0.0	7	10.4	0	27	40.1	0
SF227	172049	1	RV	15-May-91	241.6	-34.7	7	9.1	-1	41	53.3	13
SF228	172050	1	RV	16-May-91	391.6	150.0	10	21.1	12	54	113.8	60
SF11	172051	*	RV	15-May-91	518.2	126.6	16	44.6	24	329	917.2	803
SF15	172054	*	RV	15-May-91	761.3	243.1	15	61.4	17	410	1679.3	762
SF239	172056	*	RV	15-May-91	626	-135.3	19	64.0	3	363	1222.5	-457
SF272	172058	*	RV	14-May-91	532.1	-93.9	26	74.4	10	357	1022.0	-201
SF249	172062	*	RV	14-May-91	513.3	-18.8	31	85.6	11	372	1027.3	5
SF253	172065	*	RV	14-May-91	624.5	111.2	21	70.6	-15	345	1159.1	132
SF259	172066	*	RV	14-May-91	920.2	295.7	34	168.3	98	453	2242.7	1084
SF268	172005	*	RV	15-May-91	1040	119.8	14	78.3	-90	451	2523.4	281
SF271	172000	*	RV	15-May-91	1700	660.0	28	256.1	178	508	4646.2	2123
SF205	172071	1	RV	04-Oct-91	6.47	0.0	1	0.0	0	0	0.0	0
SF208	172072	1	RV	04-Oct-91	11.8	5.3	2	0.1	0	0	0.0	0
SF215	172073	1	RV	04-Oct-91	17.8	6.0	2	0.2	0	0	0.0	0
SF220	172075	1	RV	04-Oct-91	21.6	3.8	26	3.0	3	106	12.3	12
SF227	172076	1	RV	04-Oct-91	26.6	5.0	12	1.7	-1	77	11.0	-1
SF228	172077	1	RV	04-Oct-91	25.2	-1.4	11	1.5	0	10	1.4	-10
SF10	172078	*	RV	03-Oct-91	24.1	-1.1	6	0.8	-1	13	1.7	0
SF11	172080	*	RV	03-Oct-91	41.3	17.2	26	5.8	5	831	184.6	183
SF12	172081	*	RV	03-Oct-91	44.3	3.0	23	5.5	0	1020	243.1	58
SF15	172085	*	RV	03-Oct-91	46.2	1.9	20	5.0	-1	923	229.4	-14
SF16	172086	*	RV	03-Oct-91	53.5	7.3	19	5.5	0	1030	296.5	67
SF239	172088	*	RV	03-Oct-91	56.1	2.6	19	5.7	0	1100	332.0	36

Table 4.2-1 (Continued)
Mass Loading Upper South Fork

Location	Sample No.	Upper SFCDR Segment	Sample Type	Sample Date	Flow (CFS)	Flow Delta	Total Lead Conc. (µg/l)	Total Lead Load (lbs/day)	Total Lead Delta[a] (lbs/day)	Dissolved Zinc Conc. (µg/l)	Dissolved Zinc Load (lbs/day)	Dissolved Zinc Delta[a] (lbs/day)
SF241	172089	*	RV	02-Oct-91	56.2	0.1	21	6.3	1	656	198.3	-134
SF272	172091	*	RV	02-Oct-91	55	-1.2	22	6.5	0	656	194.1	-4
SF22	172092	*	RV	02-Oct-91	51.8	-3.2	19	5.3	-1	837	233.3	39
SF249	172096	*	RV	03-Oct-91	51.7	-0.1	17	4.7	-1	1510	420.0	187
SF253	172098	*	RV	02-Oct-91	50.5	-1.2	20	5.4	1	1510	410.3	-10
SF254	172099	*	RV	02-Oct-91	57.5	7.0	18	5.6	0	1540	476.4	66
SF31	172100	*	RV	02-Oct-91	61.2	3.7	18	5.0	0	1560	513.6	37
SF259	172101	*	RV	01-Oct-91	50.8	-10.4	20	5.5	0	1370	374.4	-139
SF263	172105	*	RV	01-Oct-91	72.8	22.0	14	5.5	0	1160	454.3	80
SF264	172106	*	RV	01-Oct-91	66	-6.8	42	14.9	9	1110	394.1	-60
SF268	172107	*	RV	01-Oct-91	67.3	1.3	14	5.1	-10	1520	550.4	156
SF271	172112	*	RV	01-Oct-91	94	26.7	20	10.1	5	2640	1335.1	785
SF33	172102	*	OF	01-Oct-91	4.02	-	2	0.0	-	240	5.2	-
SF205	46540	1	RV	11-May-98	146	0.0	3.6	2.8	0	0	0.0	0
SF208	46533	1	RV	09-May-98	114	-32.0	2.7	1.7	-1	6	3.7	-
SF215	46538	1	RV	10-May-98	428	314.0	3.4	7.8	6	7.6	17.5	14
SF220	46537	1	RV	10-May-98	432	4.0	5.8	13.5	5	42.2	98.1	81
SF227	46536	1	RV	10-May-98	435	3.0	6	14.0	1	64.3	150.5	52
SF228	46534	1	RV	10-May-98	859	424.0	5.1	23.6	10	74.3	343.4	193
SF273	46554	*	RV	13-May-98	776	-83.0	20	83.5	60	296	1235.8	892
SF233	46551	*	RV	13-May-98	719	-57.0	21.7	83.9	0	443	1713.6	478
SF235	46555	*	RV	13-May-98	918	199.0	18.2	89.9	6	368	1817.5	104
SF274	46552	*	RV	13-May-98	883	-35.0	19.3	91.7	2	369	1752.9	-65
SF239	46550	*	RV	13-May-98	865	-18.0	18.2	84.7	-7	412	1917.3	164
SF272	46549	*	RV	12-May-98	899	34.0	20.6	99.6	15	342	1654.1	-263

Table 4.2-1 (Continued)
Mass Loading Upper South Fork

Location	Sample No.	Upper SFCDR Segment	Sample Type	Sample Date	Flow (CFS)	Flow Delta	Total Lead Conc. (µg/l)	Total Lead Load (lbs/day)	Total Lead Delta[a] (lbs/day)	Dissolved Zinc Conc. (µg/l)	Dissolved Zinc Load (lbs/day)	Dissolved Zinc Delta[a] (lbs/day)
SF249	46547	*	RV	12-May-98	758	-141.0	21.4	87.3	-13	371	1513.0	-141
SF253	46545	*	RV	12-May-98	865	107.0	21.9	101.9	15	414	1926.6	414
SF254	46546	*	RV	12-May-98	1390	525.0	24.7	184.7	83	412	3081.0	1154
SF259	46544	*	RV	12-May-98	902	-488.0	17	82.5	-102	429	2081.8	-999
SF264	46579	*	RV	16-May-98	776	-126.0	17.4	72.6	-10	472	1970.5	-111
SF268	46543	*	RV	11-May-98	1280	504.0	19.1	131.5	59	324	2231.2	261
SF270	46542	*	RV	11-May-98	1230	-50.0	7.7	51.0	-81	525	3474.1	1243
SF271	46541	*	RV	11-May-98	1530	300.0	58.4	480.7	430	502	4132.2	658
SF205	168411	1	RV	10-Nov-97	13.5	0.0	0.27	0.0	0	6.78	0.5	0
SF208	168414	1	RV	10-Nov-97	21.5	8.0	2.3	0.3	0	10	1.2	1
SF215	168421	1	RV	09-Nov-97	34.4	12.9	32.8	6.1	6	11.4	2.1	1
SF220	168425	1	RV	08-Nov-97	42.2	7.8	8.4	1.9	-4	135	30.6	29
SF227	168432	1	RV	07-Nov-97	53.7	11.5	11	3.2	1	164	47.4	17
SF228	168433	1	RV	07-Nov-97	73.7	20.0	7.3	2.9	0	193	76.5	29
SF232	168437	*	RV	09-Nov-97	86.3	12.6	36.8	17.1	14	1310	608.2	532
SF233	168438	*	RV	09-Nov-97	85.5	-0.8	30.6	14.1	-3	1330	611.8	4
SF235	168440	*	RV	08-Nov-97	111	25.5	49.1	29.3	15	1020	609.1	-3
SF237	168411	*	RV	08-Nov-97	149	38.0	32.1	25.7	-4	1130	905.8	297
SF239	168414	*	RV	07-Nov-97	118	-31.0	43.3	27.5	2	1180	749.1	-157
SF241	168421	*	RV	07-Nov-97	119	1.0	40.8	26.1	-1	1110	710.6	-38
SF243	168448	*	RV	08-Nov-97	120	1.0	31.6	20.4	-6	1160	748.9	38
SF247	168451	*	RV	07-Nov-97	150	30.0	31.2	25.2	5	1260	1016.8	268
SF249	168453	*	RV	06-Nov-97	121	-29.0	30.8	20.1	-5	1190	774.7	-242
SF253	168456	*	RV	06-Nov-97	131	10.0	26.8	18.9	-1	1230	866.9	92
SF254	168457	*	RV	06-Nov-97	146	15.0	27.1	21.3	2	1300	1021.1	154

Table 4.2-1 (Continued)
Mass Loading Upper South Fork

Location	Sample No.	Upper SFCDR Segment	Sample Type	Sample Date	Flow (CFS)	Flow Delta	Total Lead Conc. (µg/l)	Total Lead Load (lbs/day)	Total Lead Delta[a] (lbs/day)	Dissolved Zinc Conc. (µg/l)	Dissolved Zinc Load (lbs/day)	Dissolved Zinc Delta[a] (lbs/day)
SF258	168461	*	RV	06-Nov-97	144	-2.0	25.4	19.7	-2	1360	1053.6	32
SF259	168462	*	RV	06-Nov-97	145	1.0	22.3	17.4	-2	1380	1076.5	23
SF263	168466	*	RV	05-Nov-97	162	17.0	22	19.2	2	1080	941.3	-135
SF264	168467	*	RV	05-Nov-97	163	1.0	19.9	17.5	-2	1070	938.3	-3
SF268	168471	*	RV	05-Nov-97	177	14.0	19.3	18.4	1	1190	1133.2	195
SF270	168473	*	RV	04-Nov-97	183	6.0	30.6	30.1	12	2010	1978.9	846
SF271	168474	*	RV	04-Nov-97	248	65.0	28.2	37.6	7	1540	2054.7	76
SF228	202431	1	RV	24-Nov-98	49.7	0.0	15	4.0	0	282	75.4	0
SF268	202431	*	RV	24-Nov-98	156	106.3	14	11.7	8	1580	1326.1	1251
SF270	202432	*	RV	24-Nov-98	139.4	-16.6	38	28.5	17	2490	1867.4	541
SF271	202433	*	RV	24-Nov-98	297	157.6	35	55.9	27	1840	2940.1	1073

[a]The Delta value reported at a sample location is the difference between Mass load at that location and the next upstream Sample location, except for side streams and adits which are the mass load at that location.

* : Sample Location in CSM2, Segments MidGradSeg01 and MidGradSeg02

\- : Mass Load or Delta not calculated

RV: River Sample

OF: Outfall Sample

CFS: Cubic feet per Second

µg/l: Micrograms per liter

lbs/day: pounds per day

5.0 FATE AND TRANSPORT

The fate and transport of metals in surface water, groundwater, and sediment in the Upper South Fork Watershed are discussed in this section. A conceptual model of fate and transport, important fate and transport mechanisms, and a summary of the probabilistic model developed to evaluate fate and transport, were presented in the fate and transport section in the Canyon Creek report and are not repeated here. This section draws upon that general information.

Initial findings on metals concentrations and mass loading for this segment, as presented in Section 4, Nature and Extent, are briefly summarized in Section 5.1. Results of the probabilistic modeling are presented in Section 5.2. Sediment transport is summarized in Section 5.3. A summary of fate and transport of metals in the Upper South Fork Watershed is presented in Section 5.4.

5.1 INTRODUCTION

The Upper South Fork Watershed contributes significant quantities of cadmium, lead, zinc, and other metals to the South Fork. The lowest and highest dissolved cadmium, lead, and zinc and total lead loadings measured during six sampling events (from October 1991 to May 1999) are listed in Table 5.1-1. Potential sources of these metals in the watershed were identified for each segment in Section 4.1 and preliminary mass loading estimates were discussed in Section 4.2. Brief summaries of those results are included in this section.

5.2 MODEL RESULTS

Results from the probabilistic model are discussed for cadmium, lead, and zinc in this section. Modeling results for estimates of discharge are discussed in Section 5.2.1. Modeling results for estimates of chemical concentrations and mass loading of cadmium, lead, and zinc are discussed in Section 5.2.2. Data and associated calculations are included in Appendix C.

Data were evaluated for two separate sampling locations. Only sampling locations with 10 or more individual data points for each parameter of interest were evaluated. The two sampling locations, in order from upstream to downstream, are SF220 and SF228. Sampling locations are shown on Figure 5.2-1. The first, and most upgradient, sampling location evaluated, SF220, is immediately downstream of Mullan. The second sampling location, SF228, is situated a couple of river miles upstream of Wallace and immediately downstream of the Golconda tailings.

River stretches bracketed by sampling locations are designated reaches. For example, the portion of the Upper South Fork lying between sampling locations SF220 and SF228 is called a reach. Accordingly, there is one reach encompassed by the two sampling locations.

5.2.1 Estimated Discharge

An example of the lognormal distribution of discharge data at sampling location SF228 at is shown in Figure 5.2-2. Data from sampling location SF228 are used throughout this discussion for consistency of presentation and because more data are available at this location than at other locations. In Figure 5.2-2, discharge (in cfs) is plotted on a log scale versus the normal standard variate. The normal standard variate is equivalent to the standard deviation for a normalized variable. When the log of a variable (e.g., discharge) is plotted versus the standard normal variate, a straight line will result if the data are lognormally distributed. The cumulative distribution function gives the probability that the observed discharge at any given time will not be exceeded by the estimated discharge at that cumulative probability. The cumulative distribution function is plotted versus the normal standard variate in Figure 5.2-3. To determine the probability of occurrence of a specific discharge, first select the discharge of interest on Figure 5.2-2, then find its corresponding normal standard variate. Using that value for the normal standard variate, look up its corresponding cumulative probability in Figure 5.2-3. For example, for a discharge of 100 cfs, the normal standard variate is approximately 0.4 (Figure 5.2-2). Looking on Figure 5.2-3, this value corresponds to a cumulative probability of approximately 0.66; therefore, approximately 66 percent of the time, discharges at this location will be 100 cfs or less.

The probability distribution function (PDF) shown in Figure 5.2-2 is a predictive tool that can be used to estimate the expected discharge and provide a quantitative estimate of the probability that the observed discharge will not exceed a given value. Conversely, one can find the estimated discharge rate having a specified probability of exceedance or non-exceedance by the observed discharge.

As shown in Figure 5.2-2, there is a good fit of the lognormal regression line (solid line in Figure 5.2-2) to the data. This goodness of fit, as evidenced by a high coefficient of determination (r^2 = 0.92), supports the assumption that discharges are lognormally distributed. The dotted line represents the true (ideal) lognormal distribution having the same mean (118) and coefficient of variation (1.38) as the actual data. The expected value, or average discharge rate, for the Upper South Fork at location SF228 is approximately 115 cfs. Expected values for discharge at both sampling locations are summarized in Table 5.2-1.

Estimated gains or losses in discharge (EV) and the coefficients of variation (CV) for the one reach on the Upper South Fork are listed in Table 5.2-2. The reach between SF220 and SF228 gains an estimated 28.8 cfs. Losses tend to occur where the gradient lessens and the valley broadens, while gains generally occur where the valley narrows.

5.2.2 Estimated Zinc, Lead, and Cadmium Concentrations and Mass Loading

Dissolved cadmium and zinc and total lead concentrations and loads were evaluated using the probabilistic model at the two sampling locations (one reach) that contained a minimum of ten data points.

5.2.2.1 Individual Sampling Locations

To illustrate the lognormal distribution of dissolved zinc, total lead, and dissolved cadmium concentrations and dissolved zinc, total lead, and dissolved cadmium loading at sampling location SF228 on the Upper South Fork, Figures 5.2-4 through 5.2-9 are provided. The high r-squared values (r^2) for the dissolved concentrations and total loads when plotted lognormally attest to the fact that the data follow a lognormal distribution. For dissolved concentrations, the r-squared values for zinc and cadmium were 0.79 and 0.90, respectively. The r-squared value for the total lead concentration was 0.87. The corresponding values for dissolved zinc, total lead, and dissolved cadmium loads were 0.83, 0.96, and 0.96, respectively.

To assist in interpreting and placing the results in context, screening levels, and expected values are shown on the figures where applicable. In the Final Technical Support Document of August 2000 (USEPA 2000), no TMDLs were provided for the Upper South Fork and, therefore, no TMDLs are included on the plots.

The screening level for dissolved cadmium in surface waters is 0.38 µg/L. Several cadmium measurements at SF228 were above this screening level. None of the measured cadmium concentrations exceeded 10 times the screening level (Figure 5.2-4). The estimated dissolved cadmium concentration of approximately 1.07 µg/L is greater than the screening level.

The majority of the total lead concentrations are less than the screening level (15 µg/L) (Figure 5.2-5). The estimated expected lead concentration (approximately 9.21 µg/L) is also less than the screening level.

Almost all dissolved zinc concentrations (Figure 5.2-6) measured at sampling location SF228 fall between the screening level and 10 times the screening level of 42 µg/L. The estimated dissolved zinc concentration (188 µg/L) exceeds the screening level for zinc.

Dissolved zinc and cadmium and total lead loads are shown on Figures 5.2-9, 5.2-7, and 5.2-8, respectively. The estimated dissolved zinc load of 89.4 pounds per day at SF228 located above Wallace exceeds the 90th percentile TMDL for the dissolved zinc load (81.7 pounds/day) below Wallace. The estimated total lead load (8.22 pounds/day) at SF228 above Wallace is several-fold greater than the 90th percentile TMDL (1.64 pounds/day) for the total lead load below Wallace. Sampling location SF228 is on the South Fork before Canyon and Ninemile Creeks enter the South Fork, and sampling location SF233 (for which the TMDL was developed) is on the South Fork after Canyon and Ninemile Creeks enter the South Fork. TMDLs for non-point sources are for dissolved loads. However, the TMDL for the dissolved lead load was multiplied by a translator (USEPA 2000) to convert to a total lead load. The translator is the ratio of total lead to dissolved lead. In contrast to the dissolved zinc and total lead loads, the estimated value of the dissolved cadmium load at SF228 above Wallace (0.504 pounds/day) is lower than the 90th percentile TMDL for dissolved cadmium (0.934) established below Wallace at SF233.

Figures similar to Figures 5.2-4 to 5.2-9 were developed for each of the sampling locations. The results of these and additional analyses are presented in Appendix C. Data in Appendix C were used to compute estimated expected values and coefficients of variation for dissolved and total zinc, lead, and cadmium concentrations and loads in the one reach of the Upper South Fork. The resulting computations are presented in Tables 5.2-3 through 5.2-8. The calculations were performed in the same manner as described in the discharge section (Section 5.2.1).

The expected values of dissolved cadmium and zinc and total lead concentrations and loads generally increase, with some exceptions, as one progresses downstream on the Upper South Fork.

The reach in this segment extends from SF220 below Mullan to SF228 below the Golconda Mill site. The estimated values of the dissolved zinc concentrations and loads increase in this reach (Appendix C) by approximately 58 µg/L. Estimated value of dissolved zinc concentration at the downgradient station in this reach (SF228) exceed screening level for dissolved zinc in surface waters by approximately four-fold.

Probabilistic modeling indicated that approximately 93 percent of the cadmium concentration and essentially 100 percent of the zinc concentration would be in the dissolved phase compared to only 13 percent of the lead. Based on evaluation of data at SF228, estimated values of the total loadings from segment Upper SFCDRSeg01 for zinc, lead, and cadmium are, approximately, 89.4 pounds/day, 8.2 pounds/day, and 0.5 pounds/day, respectively.

5.2.2.2 Concentrations Versus Discharge

The following discussion is based on evaluation of data (Appendix C) at SF228. There is a decrease in dissolved zinc concentrations with increased discharge. Total lead concentrations increased with increasing discharge. Similarly to zinc, estimated values of dissolved cadmium concentrations also exhibited decreased concentrations with increased discharge.

Ion speciation solubility calculations performed with the MINTEQA2 geochemical computer code indicated there were no solid phases controlling zinc concentrations in surface waters in the Coeur d'Alene basin. Decreasing zinc and cadmium concentrations with increased discharge rates support this hypothesis by indicating that no solid has achieved equilibrium with these surface waters. Otherwise, the concentrations would remain relatively constant at different discharge rates. As indicated in the solubility and adsorption modeling, adsorption is the most likely control on zinc and cadmium concentrations. Accordingly, mechanistic modeling supports conclusions inferred from the regression analyses developed here.

5.3 SEDIMENT FATE AND TRANSPORT

Sediment transport processes were discussed in detail in Section 3. Brief summaries of sediment transport processes active in the watershed are presented in this section, followed by descriptions of sediment sources and transport processes observed in each segment.

5.3.1 Sediment Transport Processes

The physical processes of rain falling on soil, runoff from snowmelt or precipitation, channel bank and bed erosion, or mass movement incorporates sediment into streams of water. Water in streams transports, deposits, and sorts the delivered sediment based on the stream energy, discharge, and size and quantity of sediment.

Sediment transport by streams is a natural process; however, human activities such as logging, road building, urbanization, or land clearing can significantly increase the rate at which sediment transport occurs. For instance, land clearing exposes soil and rock that may be subject to erosion. Further, this disturbance may decrease the amount of water storage in the soil, increasing runoff rates and providing additional surface water and energy for sediment transport.

The rate at which sediment passes through a cross section of a stream system is referred to as the sediment yield. This annual sediment yield may be broken down into components that describe the method of transport, suspended load and bedload. Suspended load consists of particles small and light enough to be carried downstream in suspension by shear and eddy forces in the water column. Bedload consists of larger and heavier particles that move downstream by rolling, sliding or hopping on the channel bed (Dunne and Leopold 1978).

Sediment transport (particulate metal loading) occurs at even the smallest of stream channel discharge but the majority of movement occurs during moderate to high discharge when shear forces are greatest (Leopold et al. 1992). High-flow periods usually occur in the spring as a result of precipitation and snowmelt but can occur in midwinter for the same reasons. Physical erosion of riverbanks and channels during high-flow events causes particulate forms of metals to reenter the river and be transported. There is a propensity for increased erosion during high-flow events and following high flow events when river banks are saturated and the river stage decreases and a propensity for sediment deposition as river stage decreases. Upon entering Pine Creek, dissolved and particulate metals are transported downstream. In general, where the creek widens into floodplains there is a tendency for surface water to discharge dissolved metals to groundwater and deposit suspended sediment onto the streambed.

As suspended or bedload particles are transported by the river system, there is a possibility that metals will desorb from the sediments and enter the river in the dissolved phase. Furthermore, metals may enter the river from riverbank porewater. During high flow events, riverbanks and adjacent floodplain areas store water. The stored pore water can increase in concentration as metals desorb from sediments or as precipitated solid phases and minerals dissolve. As the waters subside, these dissolved metals reenter the river system and are transported.

Sediment derived in the Upper South Fork is transported through the system and into the South Fork. Sediment sources in the Upper South Fork are mine waste and tailings, rock debris situated adjacent to channels, mobilization of channel bed sediment, bank erosion, and sediment derived from road drainage. Because no sediment transport data were collected for the Upper South Fork, estimates of sediment transport for water year 1999 were made using the sediment transport analysis from Canyon and Ninemile Creeks. It should be kept in mind that sediment yields in Canyon and Ninemile Creeks may have been impacted by remediation efforts. These analyses produced annual sediment yields for Canyon and Ninemile Creeks for three size classes of particles—fines, sand, and bedload—expressed as tons per square mile of drainage area. As land use in these watersheds is similar to the land use in the Upper South Fork, these sediment yields were used to estimate sediment yield in the Upper South Fork. The sediment yield per drainage area was averaged for each size class and applied to the Upper South Fork to estimate an annual sediment yield.

With a drainage area of approximately 50 square miles, the total suspended sediment yield for water year 1999 was approximately 42 tons per year per square mile. Of that, approximately 17 tons was sand and 25 tons was fines, for a total of approximately 2,113 tons of suspended sediment transported in water year 1999. Annual bedload sediment yield was approximately 6 tons per year per square mile in water year 1999 for a total of about 300 tons. Summing estimated suspended and bedload sediment yield gives an estimate total sediment yield for water year 1999 for the Upper South Fork Watershed of 2,413 tons per year.

Suspended sediment and bedload samples were not analyzed for total metals; therefore mass loading was estimated from total and dissolved surface water data as described in Section 5.2.

5.3.2 Watershed Description

The Upper South Fork has approximately 70,000 feet, or 13.3 miles, of mapped channel. Channel slope varies from less than 1 percent at the downstream portions to more than 15 percent at the headwaters.

Moving downstream from the headwaters, the channel meanders through a valley typically 700 feet wide. Few anthropogenic constraints such as roads exist in this reach of channel. Likely sediment sources include mine waste and tailings, minor bank erosion, and channel bed remobilization with possible migration of channel location. Channel confinement by road embankments begins at the Lucky Friday Tailings Ponds. Sediment sources in this reach include minor bank erosion and channel bed remobilization. If surface water drainage from the tailings pond is connected to the Upper South Fork, it also may be a sediment source.

From the Lucky Friday Tailings Pond to the town of Mullan, the channel slope varies from 1 to 5 percent. It appears the channel is constrained in location by embankments from secondary roadways and the mill, mine, and tailings dams from the Lucky Friday Mine among others. Likely sediment sources in this area are mine waste and tailings, remobilization of channel bed material, and minor bank erosion. Sediment from the exposed areas around the mines, mills and tailings dams could also enter the Upper South Fork if surface water drainage from these sites flows into the Upper South Fork.

Interstate 90 runs adjacent to the Upper South Fork beginning near the town of Mullan. A high floodplain is situated between the channel and the I-90 embankment. Sediment sources in this reach are likely channel bed remobilization and minor bank erosion with some potential for erosion into the floodplain deposits between the channel and I-90. From the town of Mullan to the mouth of Canyon Creek, the channel is channelized and constrained. The channel flows adjacent to the Mary D Claim workings, Golconda Tailing and Golconda Mine and Millsite, with exposed sediment surrounding these areas. Likely sediment sources in this reach are remobilization of channel bed material and minor bank erosion. Sediment could be contributed from the mine and mine workings if surface water drainage from these deposits flows into the Upper South Fork.

5.3.3 Summary of Sediment Transport

Approximately 2,413 tons of sediment was transported from the Upper South Fork to the South Fork in water year 1999. Sediment sources include mine waste and tailings, channel bed remobilization, minor bank erosion, lateral migration and rock debris piles adjacent to the stream.

5.4 SUMMARY OF FATE AND TRANSPORT

The probabilistic model was used to quantify and summarize the available data and to estimate pre-remediation metals concentrations in surface water and mass loading to the Upper South Fork Watershed. Sediment transport was evaluated using USGS suspended and bedload sediment discharge data. Results are summarized in this section.

Surface water discharge, metals concentrations (total and dissolved), and mass loading data were analyzed using lognormal PDFs at two separate sampling locations in the Upper South Fork Watershed. Only results for cadmium, lead, and zinc were analyzed. Regressions were developed for total and dissolved concentrations versus discharge to quantify and identify trends in concentrations and mass loading with changing discharge rates. The percentages of dissolved and particulate forms of metals were computed from the estimated expected values predicted by the model.

Results of the probabilistic modeling indicate:

- Dissolved cadmium and zinc concentrations exceed their corresponding screening levels. Total lead concentrations remain below the screening level.

- Lead and zinc mass loading exceed the TMDLs established for the portion of the South Fork above Wallace. The estimated total dissolved cadmium load is less than the TMDL.

- In general, concentrations of dissolved cadmium and zinc tend to decrease, and total lead tends to increase, as discharge increases. Mass loading tends to increase as discharge increase.

- Potential major source areas identified in each reach are listed in Table 5.4-1. Identification of major source areas was primarily based on the estimated contributions of sites to dissolved zinc loading in surface water of the Coeur d'Alene River basin. The identification process and backup documentation is presented in Draft Technical Memorandum No. 1: Candidate Alternatives and Typical Conceptual Designs, Coeur d'Alene Basin Feasibility Study (URSG and CH2M Hill 2000).

To illustrate the observed trends of estimated expected values throughout the watershed, estimated expected values for cadmium, lead, and zinc concentrations and mass loading are shown in Figures 5.4-1 through 5.4-6.

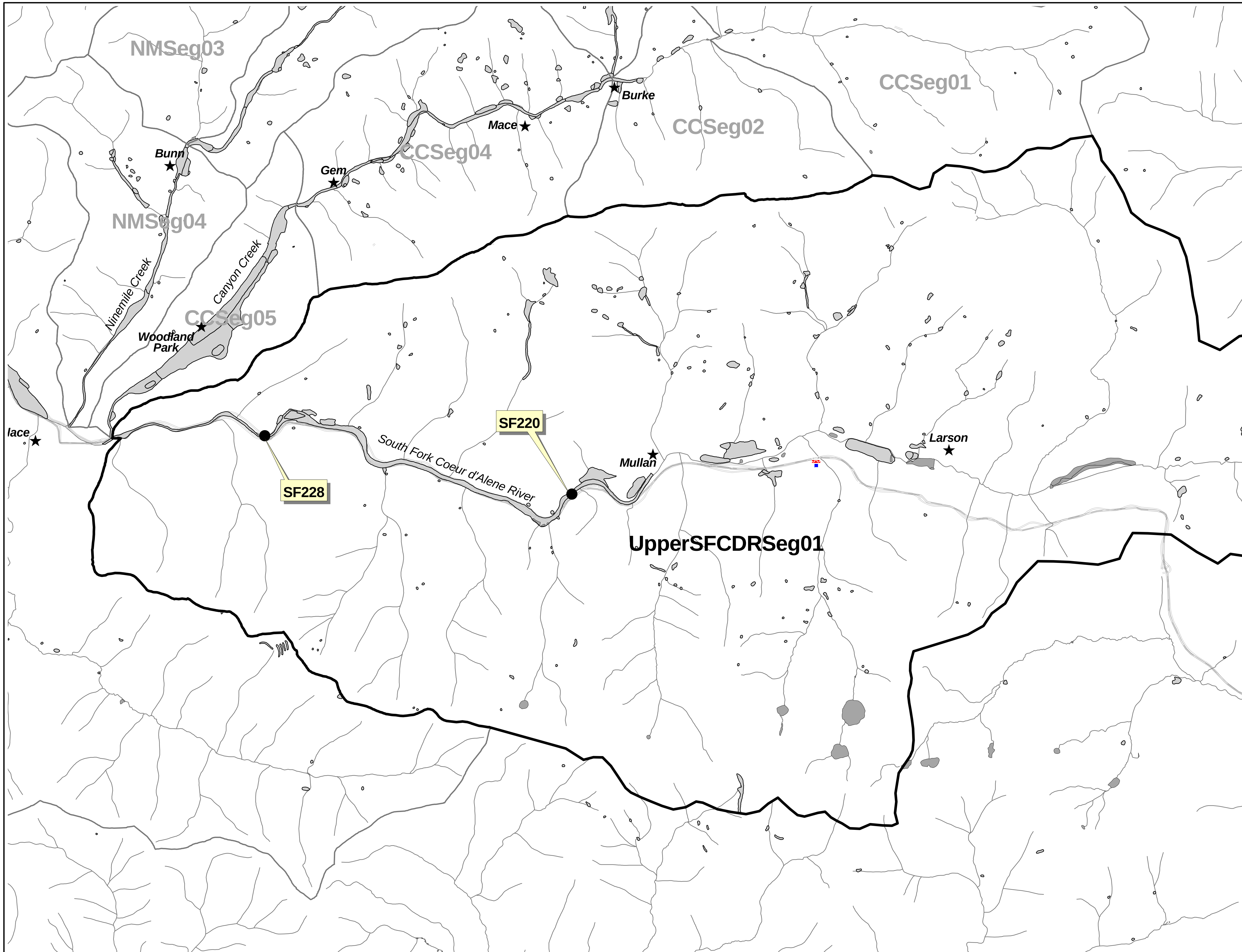
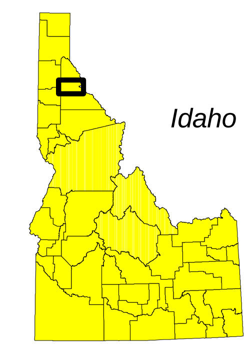


Figure 5.2-1
Upper South Fork Coeur d'Alene River Watershed Sampling Locations Evaluated in Probabilistic Modeling

LEGEND

- Sampling Location
- Stream
- Interstate 90
- City
- Upper South Fork Coeur d'Alene River Watershed
- River Segment
- Lake/River
- Source Area



Location Map

NOTES

1) Base map coverages obtained from the Coeur d'Alene Tribe, URS Greiner Inc., CH2M HILL, and the Bureau of Land Management.

SCALE 1:60,000

0.5 0 0.5 Miles

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Coeur d'Alene Basin RI/FS
RI REPORT

EPA REGION 10

Document Control 4162500.6615.05.a
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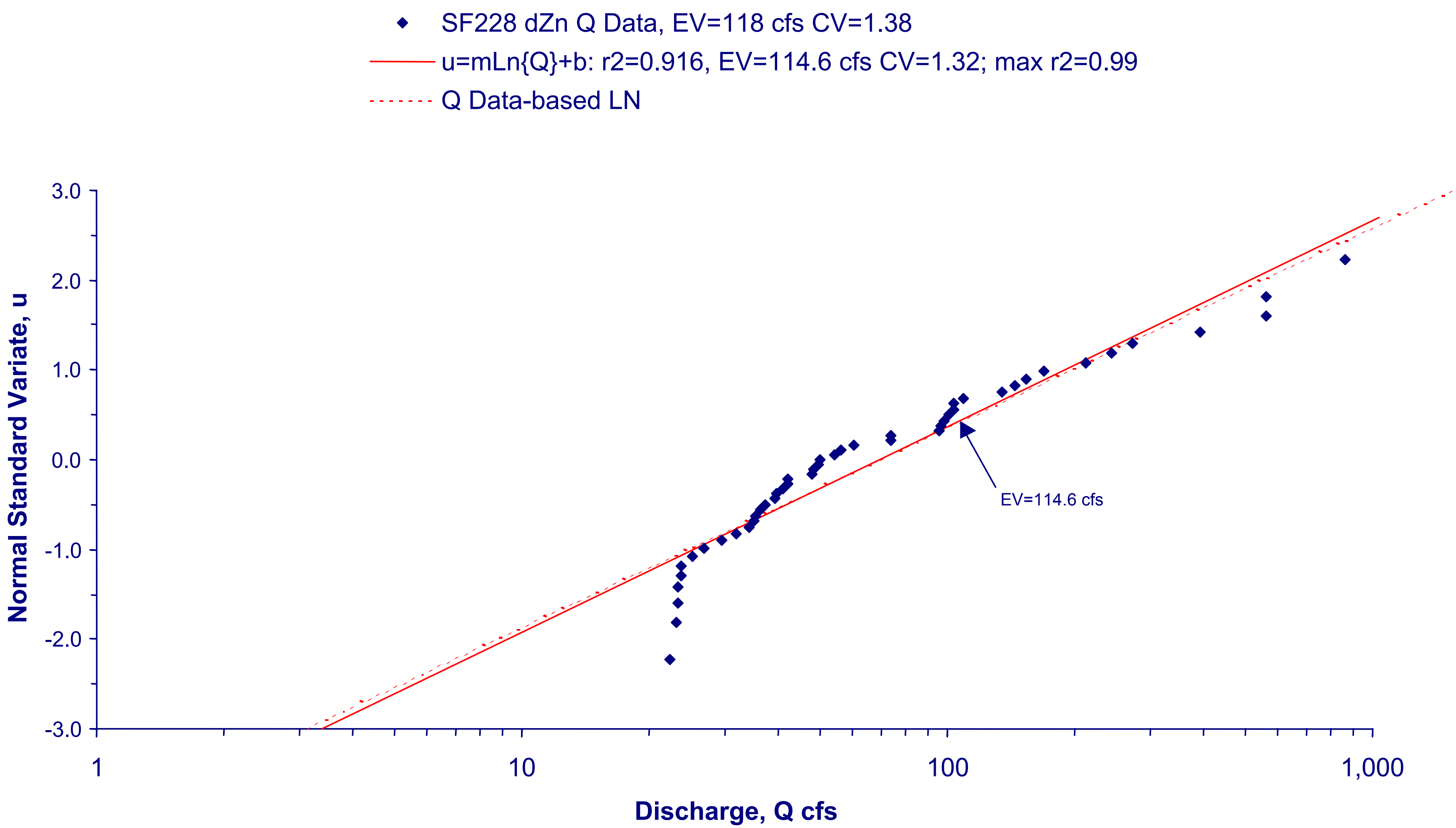
V:Locate
E:Locate
L: Final RI Locate
7/24/2001

This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: July 24, 2001

Probabilistic Modeling Results for Discharge at SF228



EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS RI REPORT	Doc Control: 4162500.6615.05.a Generation: 1 Upper South Fork Series 7/12/01	**Figure 5.2-2**

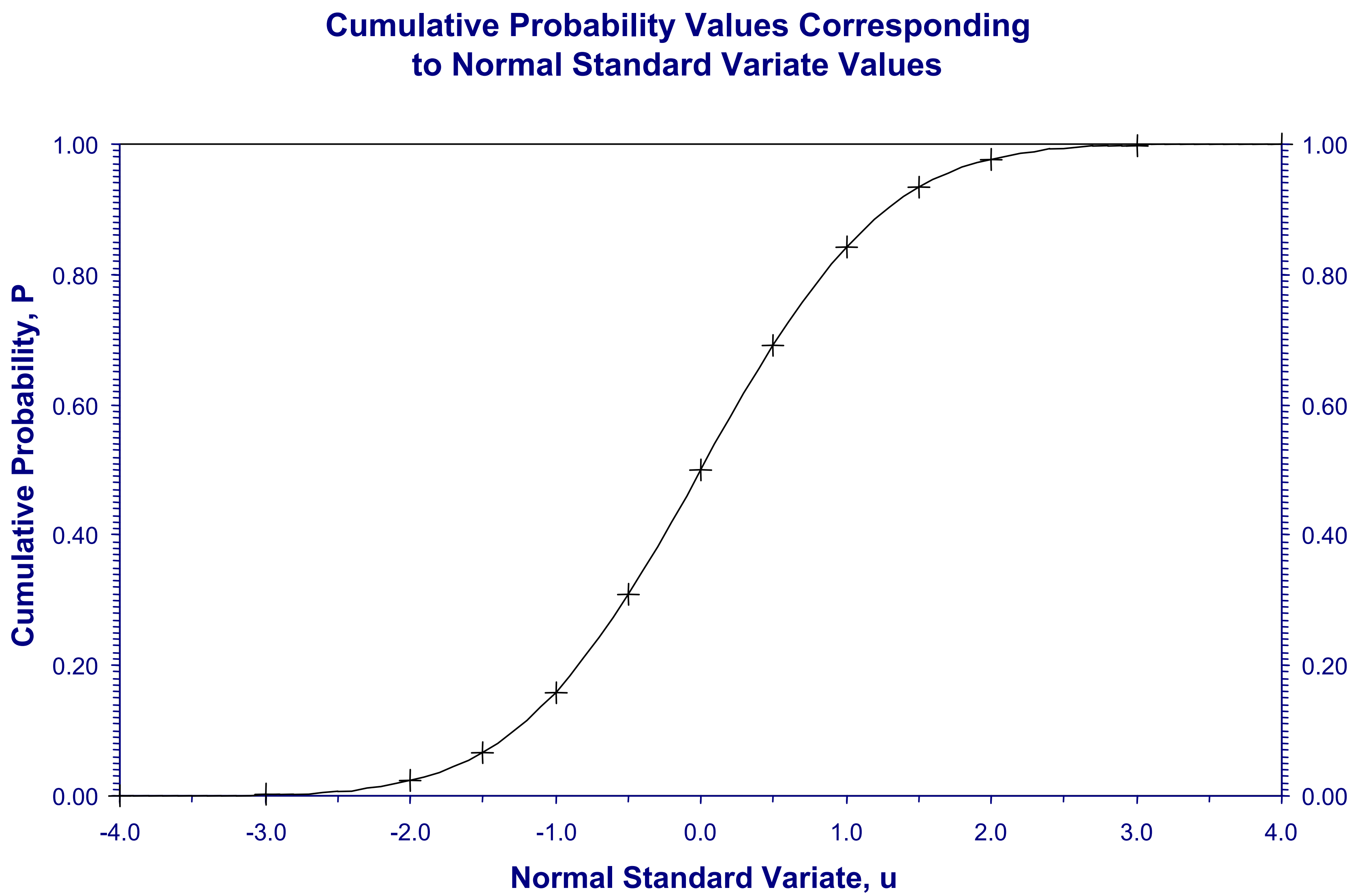


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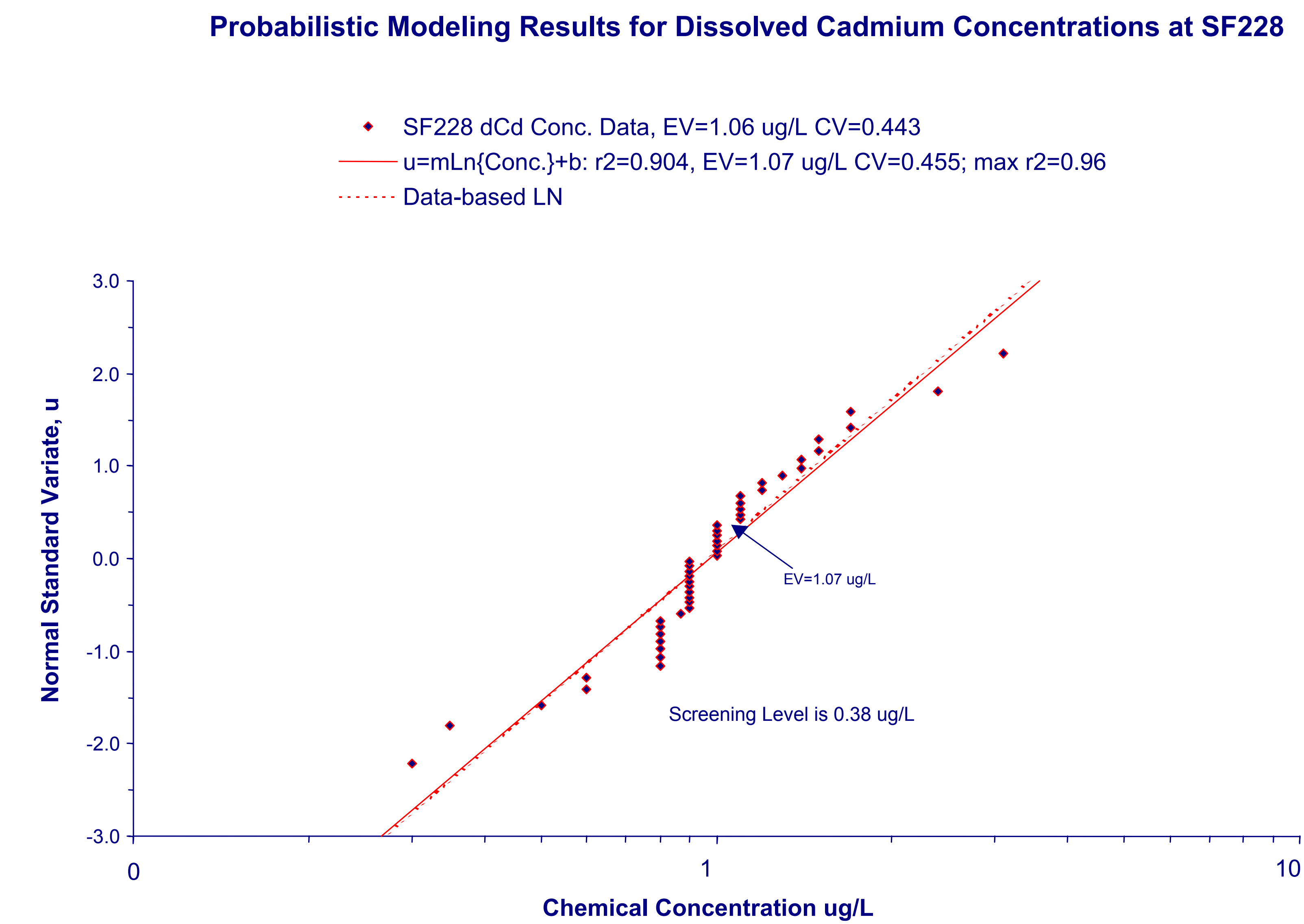
Figure 5.2-3



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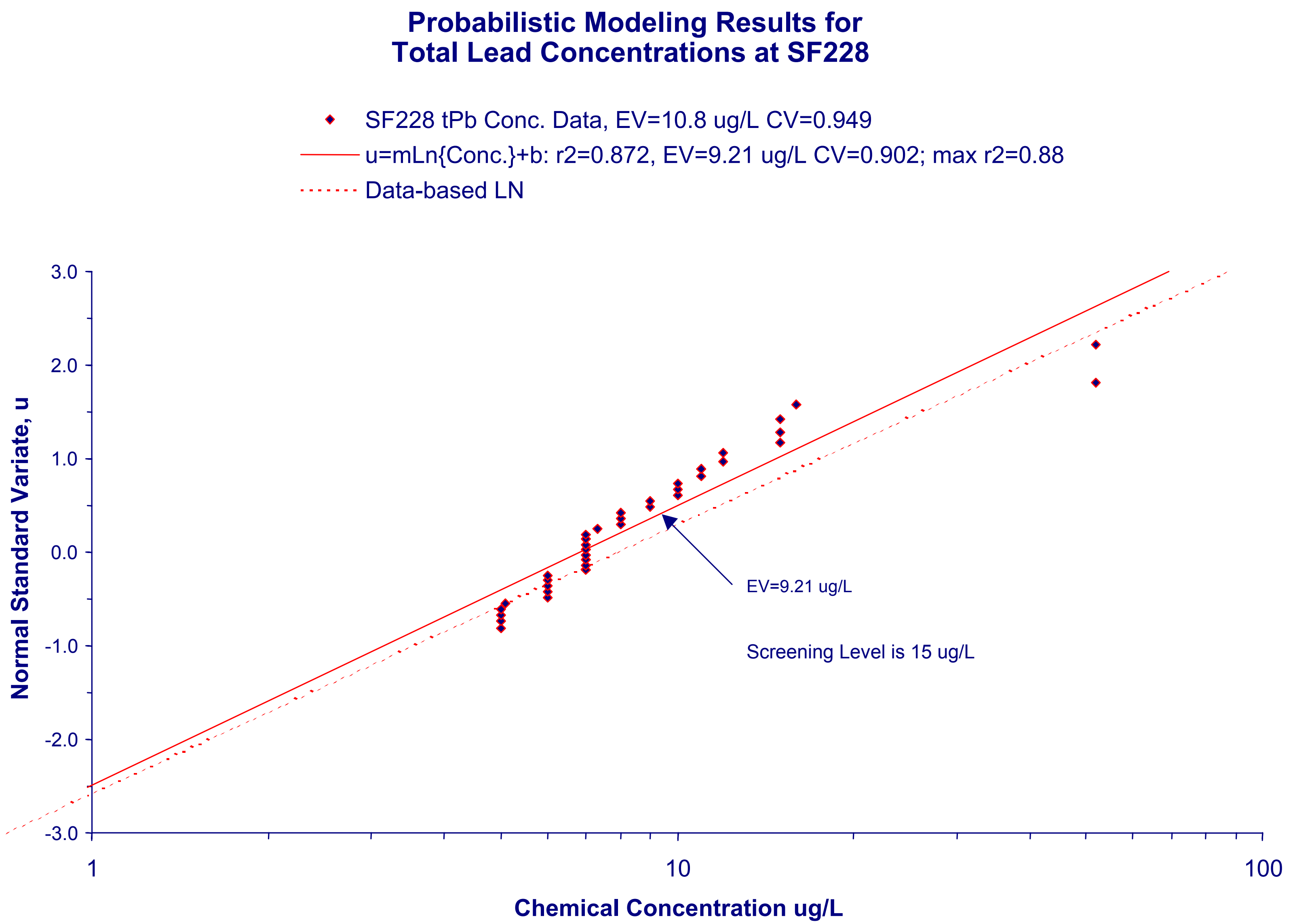
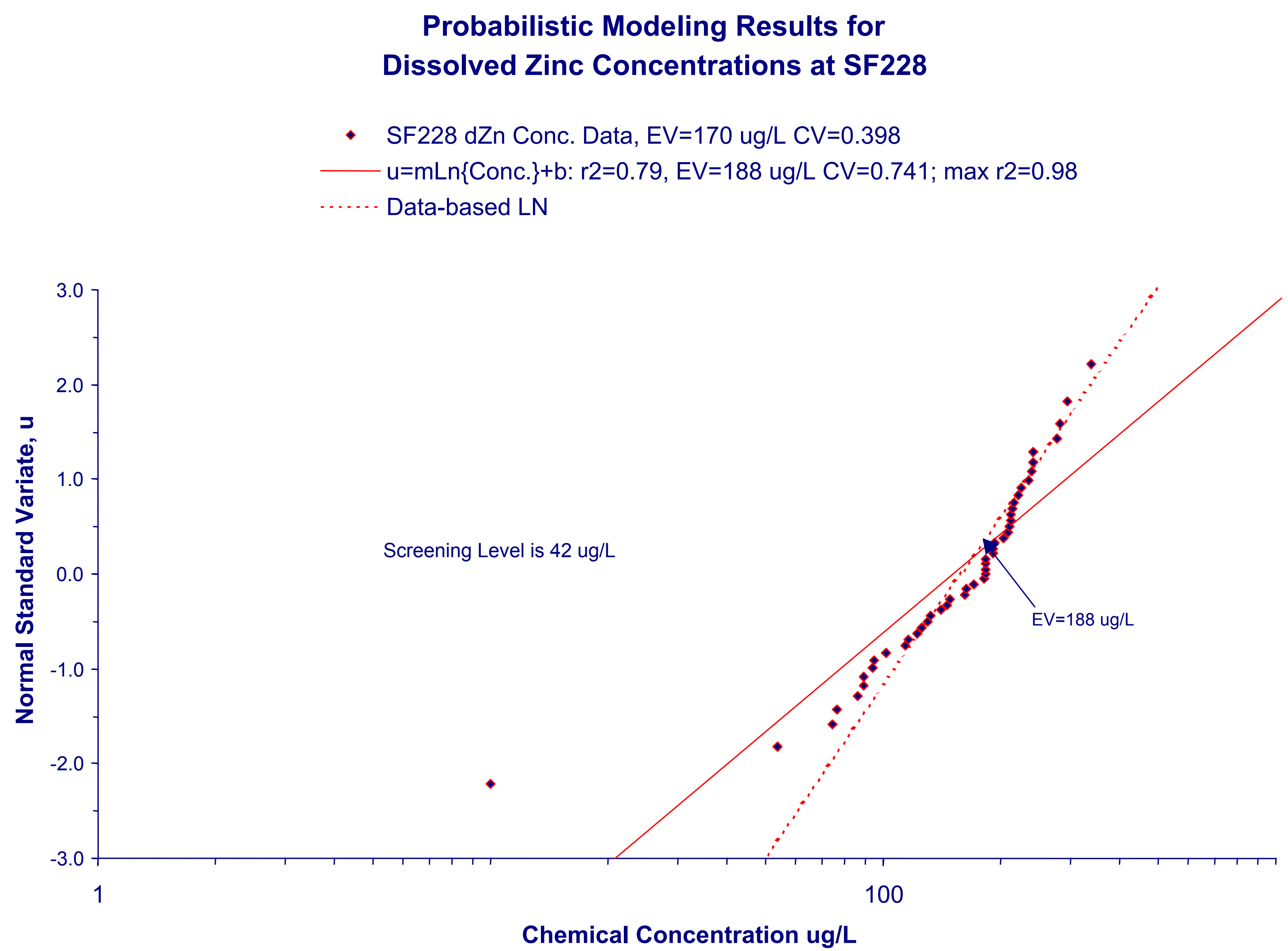
Generation: 1

Upper South Fork Series
7/12/01

Figure 5.2-4



EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS RI REPORT	Doc Control: 4162500.6615.05.a Generation: 1 Upper South Fork Series 7/12/01	**Figure 5.2-5**



EPA REGION 10

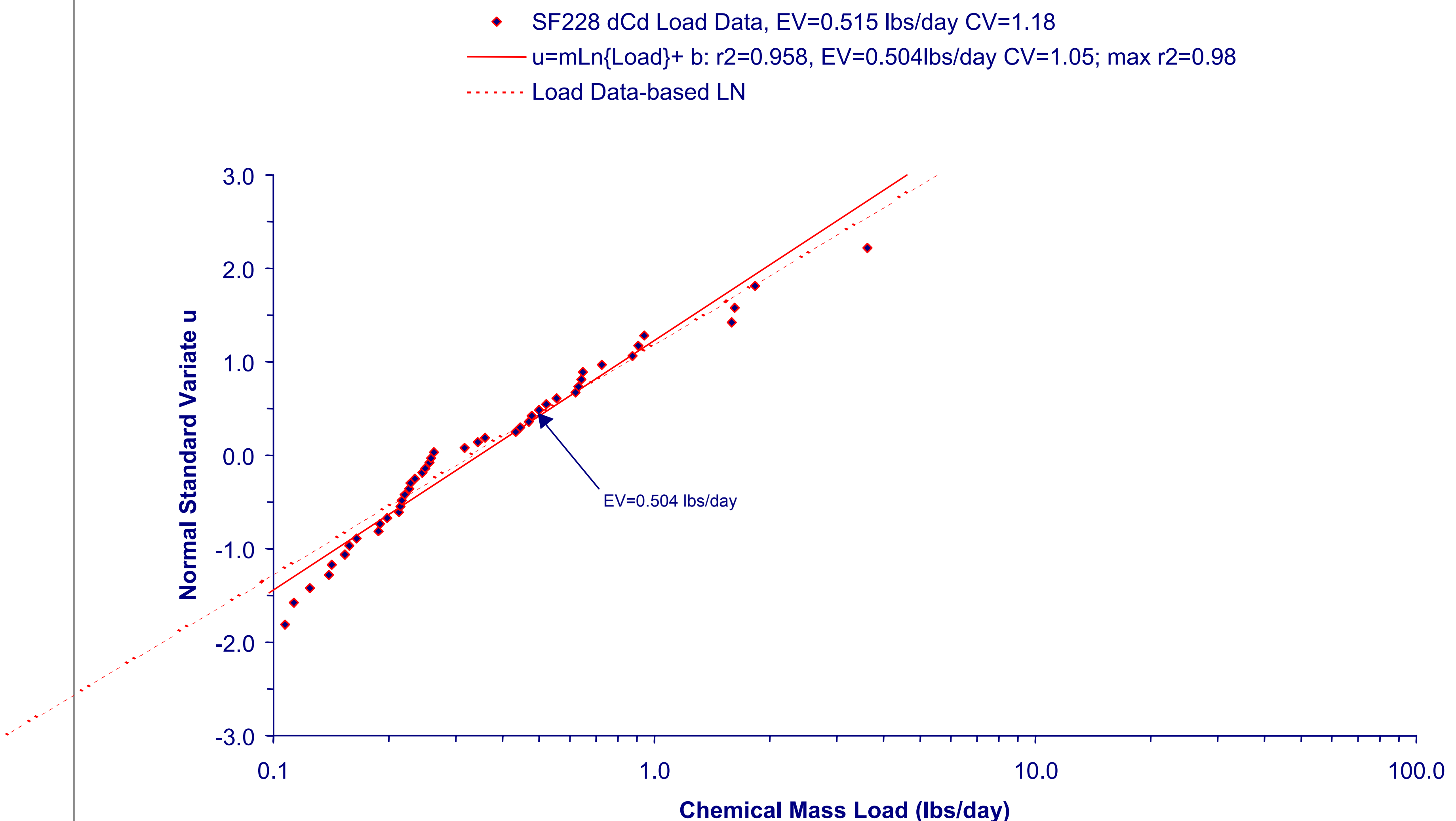
027-RI-CO-102Q
Coeur d'Alene Basin RI/FS
RI REPORT

Doc Control: 4162500.6615.05.a
Generation: 1

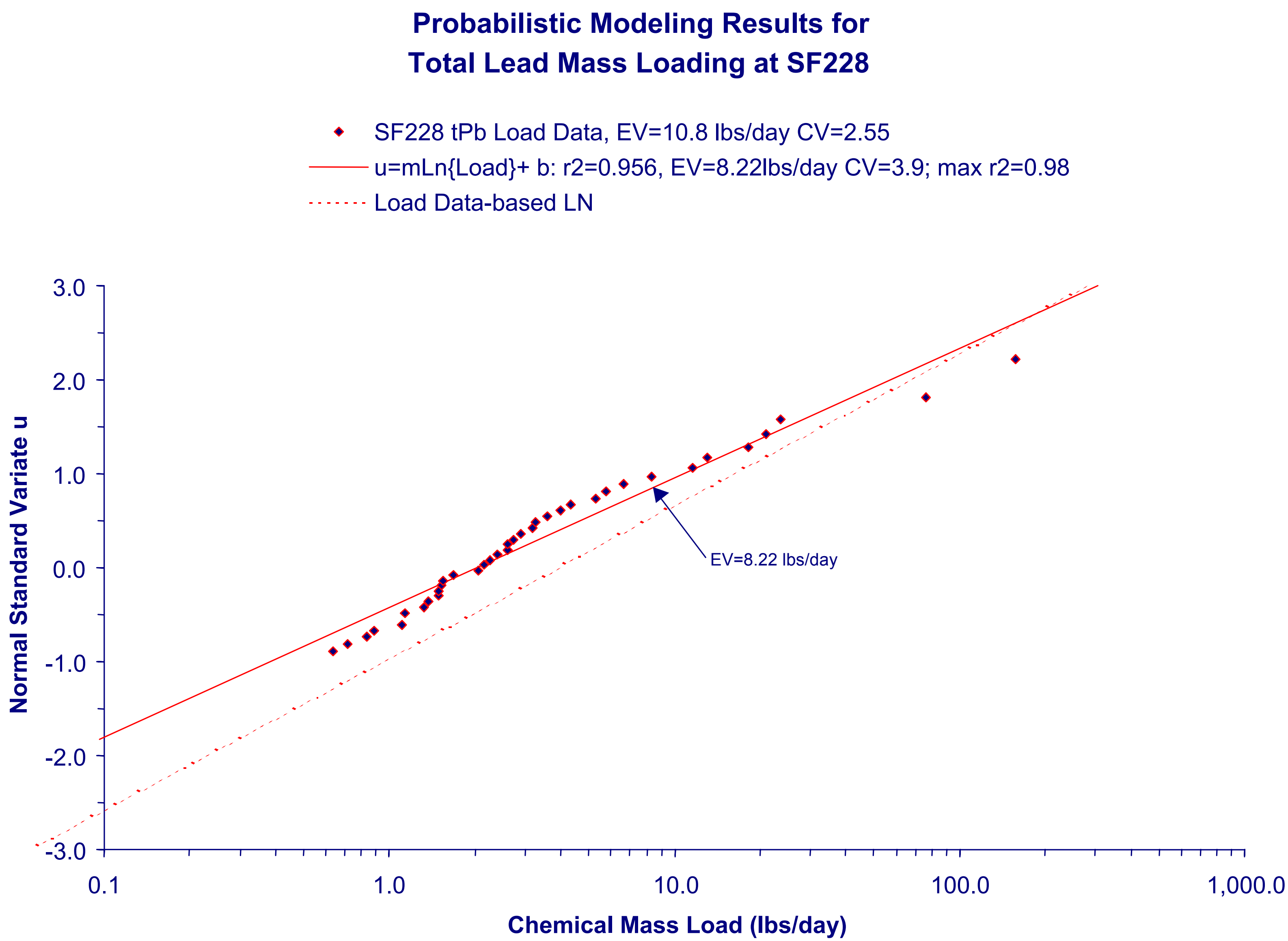
Upper South Fork Series
7/12/01

Figure 5.2-6

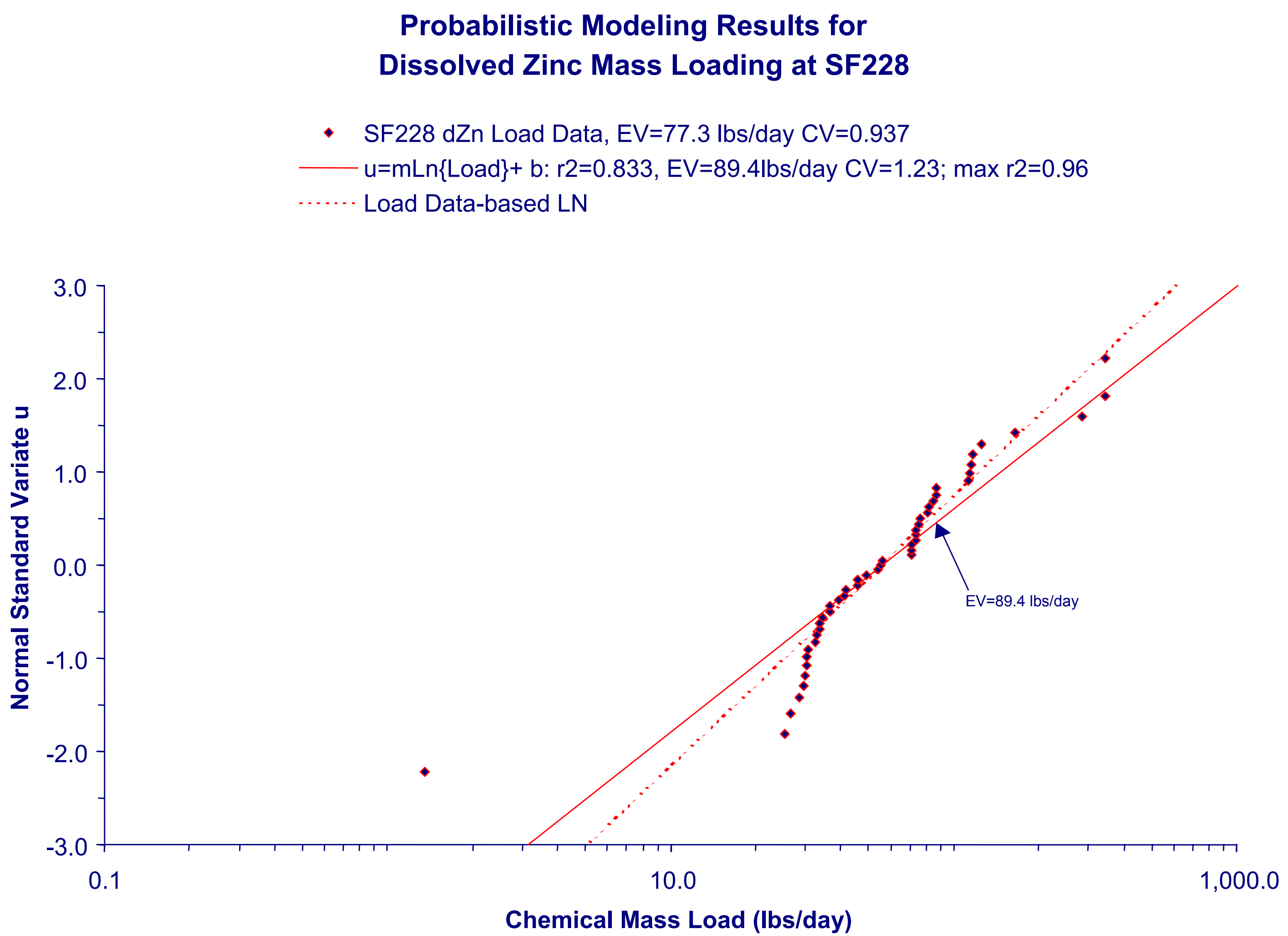
Probabilistic Modeling Results for Dissolved Cadmium Mass Loading at SF228



EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS RI REPORT	Doc Control: 4162500.6615.05.a Generation: 1 Upper South Fork Series 7/12/01		**Figure 5.2-7**



EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS RI REPORT	Doc Control: 4162500.6615.05.a Generation: 1 Upper South Fork Series 7/12/01	**Figure 5.2-8**



EPA REGION 10

027-RI-CO-102Q
Coeur d'Alene Basin RI/FS
RI REPORT

Doc Control: 4162500.6615.05.a
Generation: 1

Upper South Fork Series
7/12/01

Figure 5.2-9

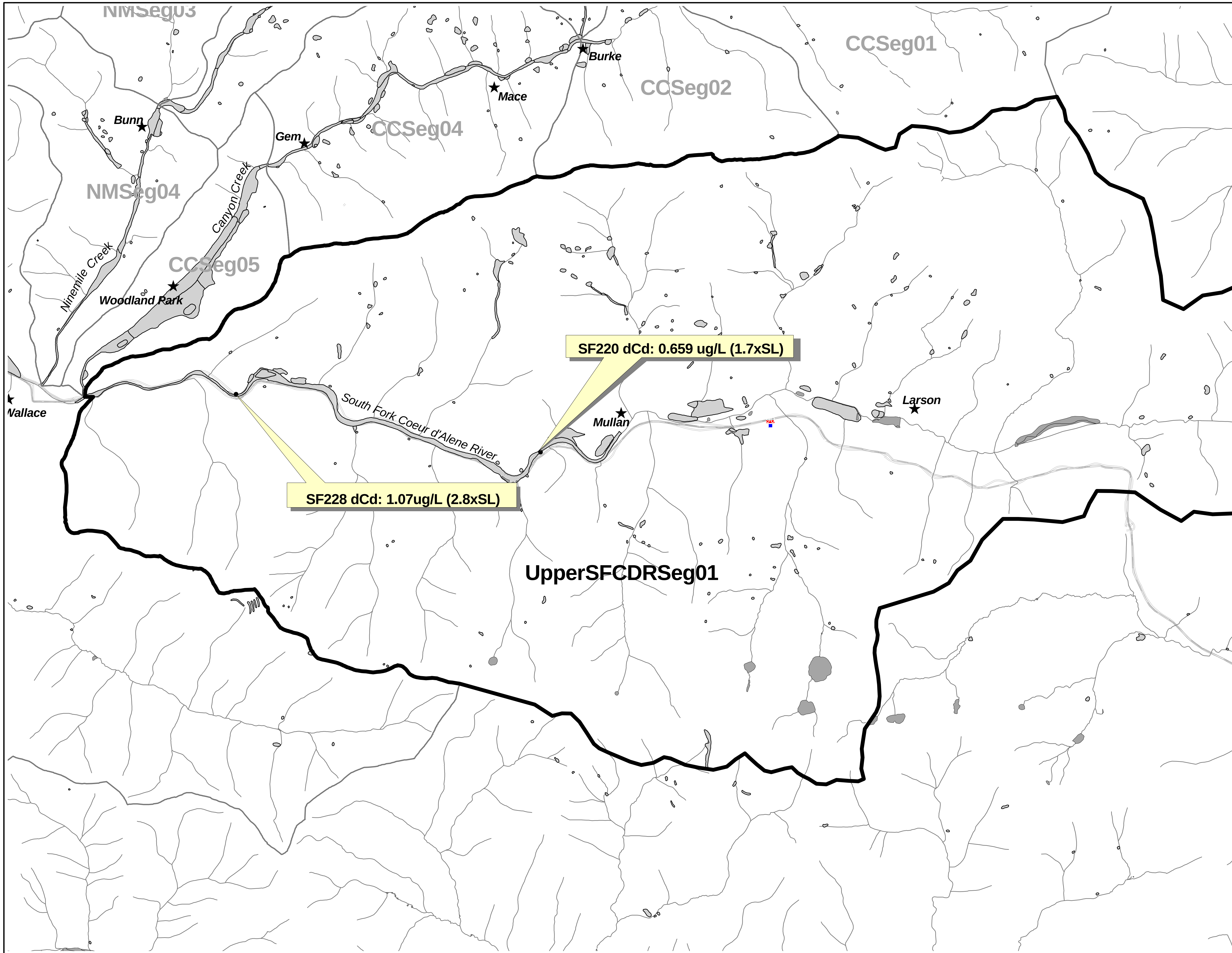


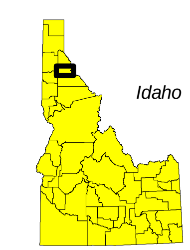
Figure 5.4-1
Upper South Fork Coeur d'Alene River Watershed Estimated Expected Values for Dissolved Cadmium Concentrations

LEGEND

Sampling Location
Concentration
SF220 dCd: 0.66ug/L (1.7xSL)
Analyte
Screening Level is 0.38 ug/L

Range of Dissolved Cadmium Concentrations in ug/L
- Range 0 - 2.5
- Range 2.5 - 5
- Range 5 - 10
- Range 10 - 15
- Range >15

- Stream
- Interstate 90
- City
- Upper South Fork Coeur d'Alene River Watershed
- River Segment
- Lake/River
- Source Area



Location Map

NOTES

1) Base map coverages obtained from the Coeur d'Alene Tribe, URS Greiner Inc., CH2M HILL, and the Bureau of Land Management.

SCALE 1:60,000

0.5 0 0.5 Miles

027-RI-C0-102Q
Coeur d'Alene Basin RI/FS
RI REPORT

EPA REGION 10

Document Control 4162500.6615.05.a
Generation 1
n:\Projects\watersheds\USFCDR\
|usfcdr_ev7-13.apr
V:dCd USFCDR concentrations
E:dCd
L: Final RI dCd Concentrations
7/24/2001

This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: July 24, 2001

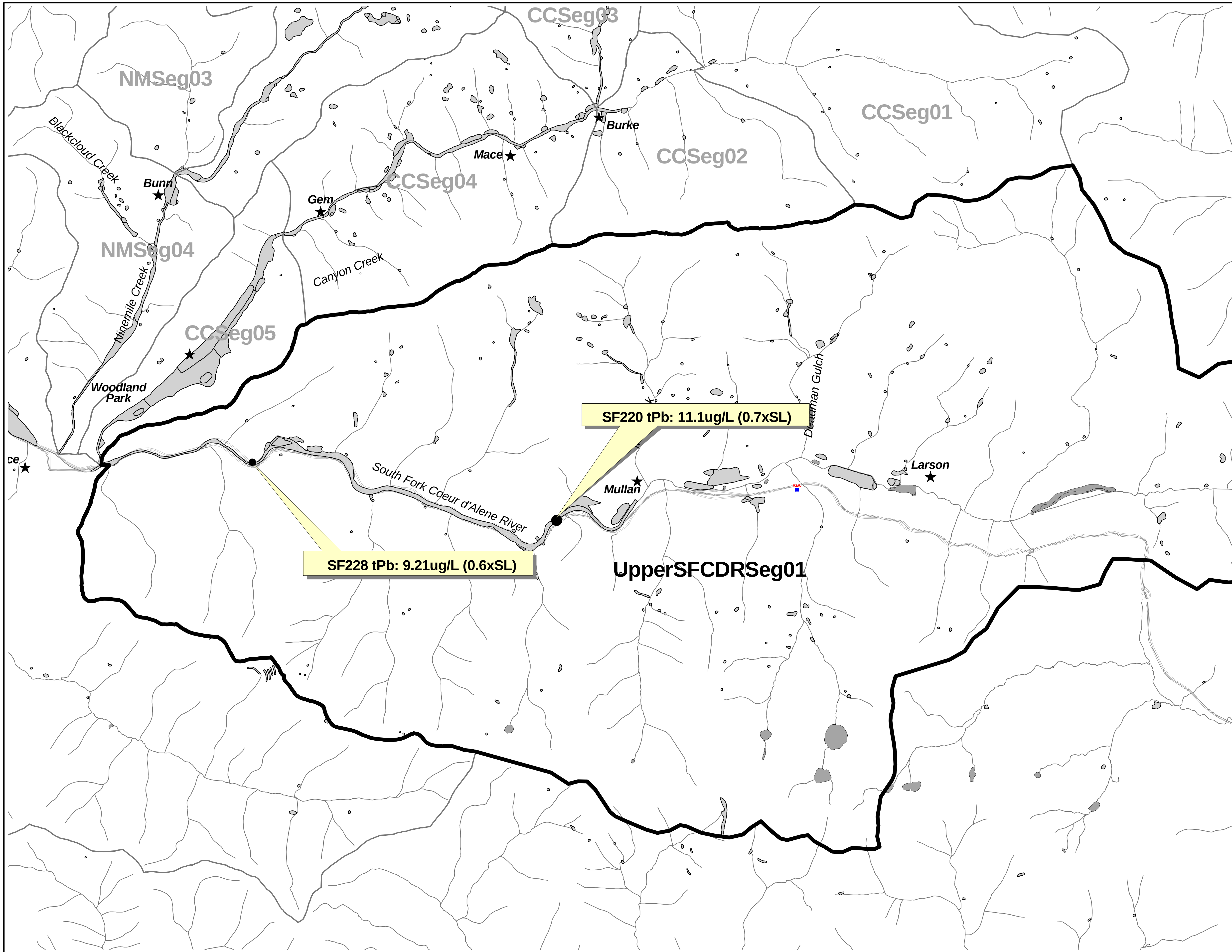


Figure 5.4-2
Upper South Fork Coeur d'Alene River Watershed
Estimated Expected Values for Total Lead Concentrations

LEGEND

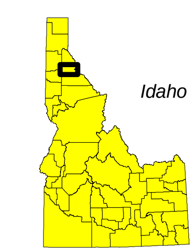
Sampling Location — Concentration

SF220 tPb: 11.1ug/L (0.7xSL)

Analyte — Screening Level is 15 ug/L

Range of Total Lead Concentrations in ug/L

- Range 0 - 5
- Range 5 - 10
- Range 10 - 50
- Range 50 - 100
- Range >100
- Stream
- Interstate 90
- City
- Upper South Fork Coeur d'Alene River Watershed
- River Segment
- Lake/River
- Source Area



Location Map

NOTES

1) Base map coverages obtained from the Coeur d'Alene Tribe, URS Greiner Inc., CH2M HILL, and the Bureau of Land Management.

SCALE 1:60,000

0.5 0 0.5 Miles

N

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Coeur d'Alene Basin RI/FS
RI REPORT

EPA REGION 10

Document Control 4162500.6615.05a
Generation 1
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V:tPb concentrations
E:tPb
L: Final RI tPb Concentrations
7/24/2001

This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: July 24, 2001

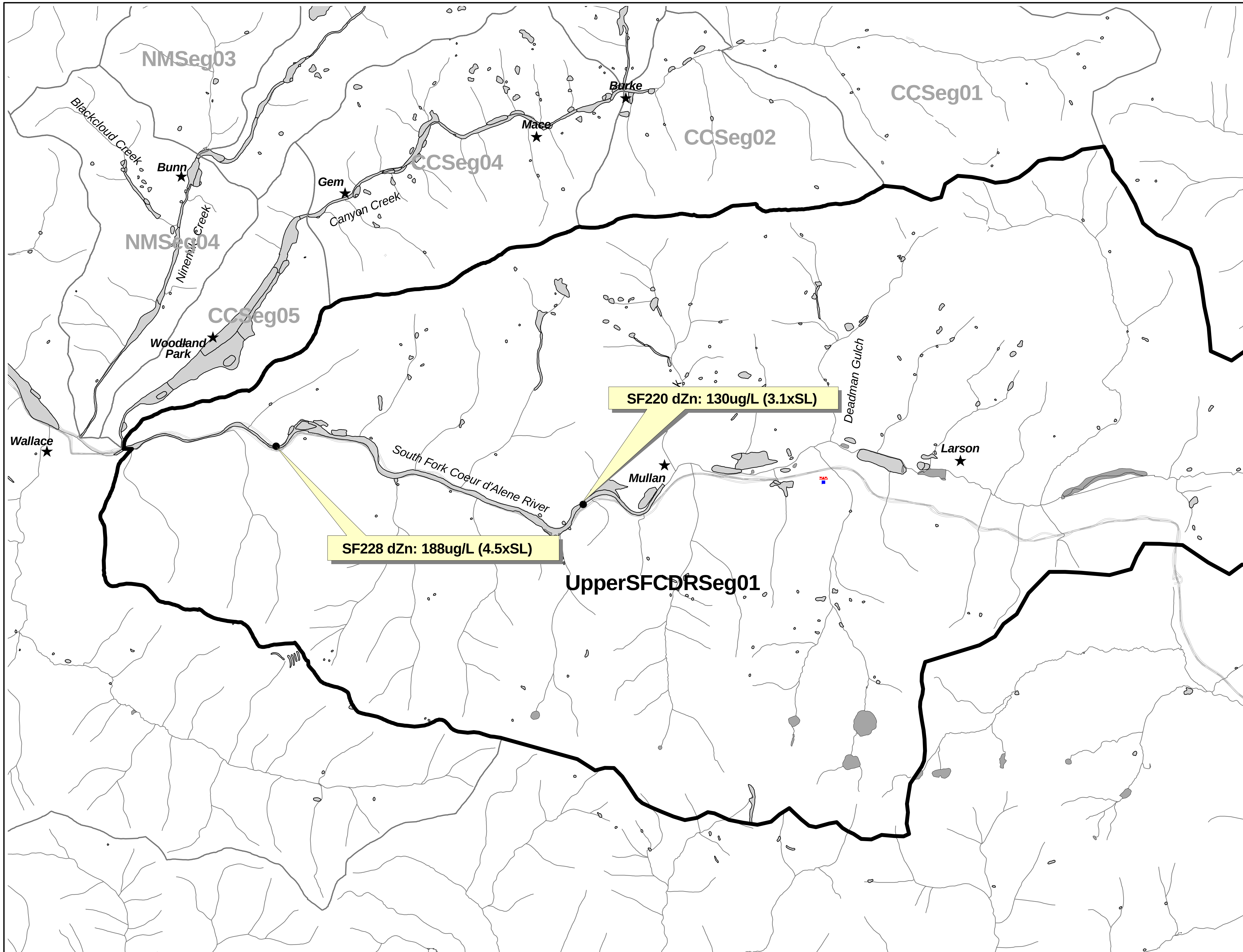

Figure 5.4-3
Upper South Fork Coeur d'Alene River Watershed Estimated Expected Values for Dissolved Zinc Concentrations

LEGEND

Sampling Location
Concentration
SF220 dZn: 130.2ug/L (3.1xSL)
Analyte
Screening Level is 42 ug/L

Range of Dissolved Zinc Concentrations in ug/L
- Range 0 - 100
- Range 100 - 500
- Range 500 - 1000
- Range 1000 - 1500
- Range >1500

- Stream
- Interstate 90
- City
- Upper South Fork Coeur d'Alene River Watershed
- River Segment
- Lake/River
- Source Area

Idaho
Location Map

NOTES

1) Base map coverages obtained from the Coeur d'Alene Tribe, URS Greiner Inc., CH2M HILL, and the Bureau of Land Management.

SCALE 1:60,000
0.5 0 0.5 Miles

N

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Coeur d'Alene Basin RI/FS
RI REPORT

EPA REGION 10

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Generation 1
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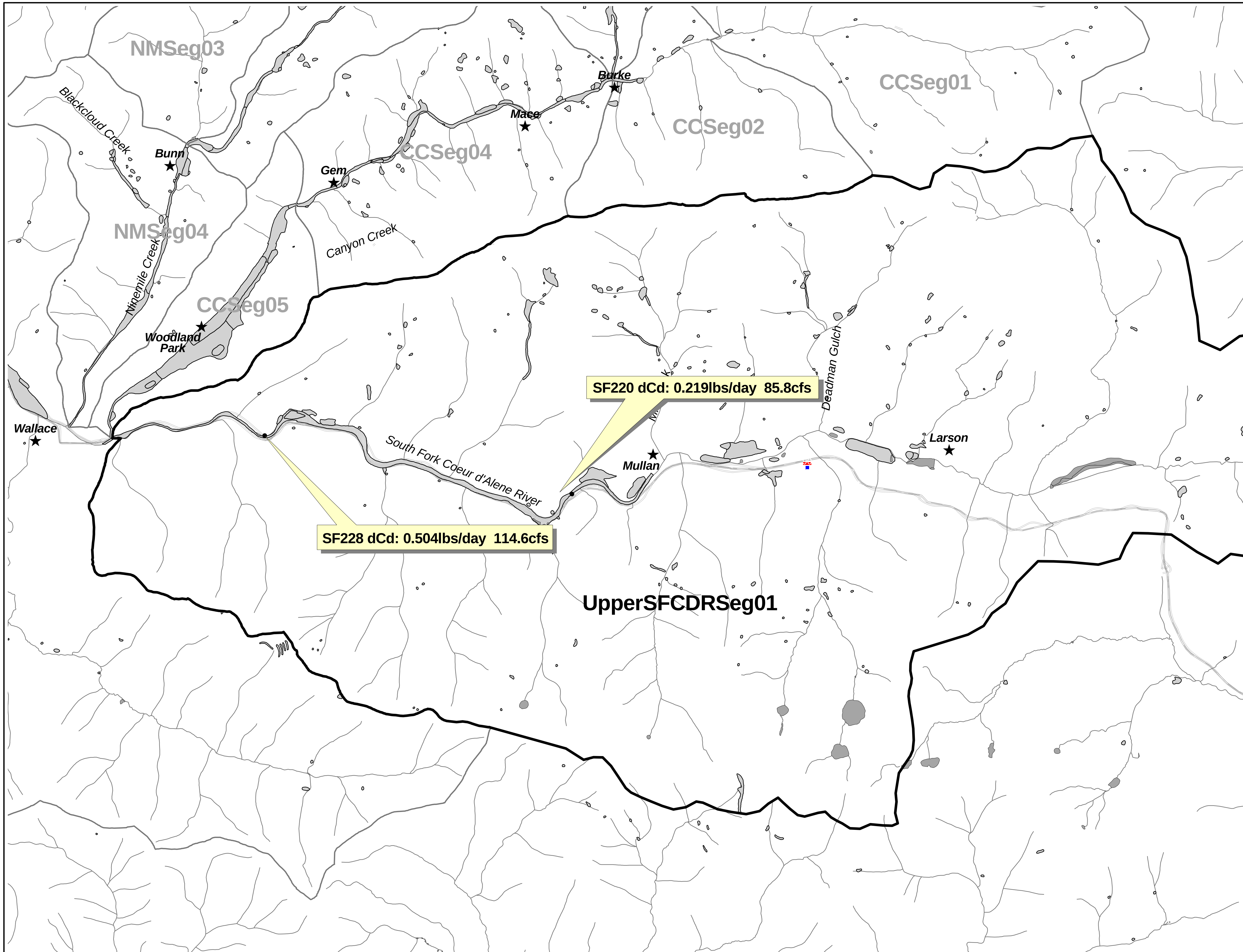
V:dZn concentrations
E:dZn
L: Final RI dZn concentrations
7/24/2001

This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: July 24, 2001

Figure 5.4-4
Upper South Fork Coeur d'Alene River Watershed Estimated Expected Values for Dissolved Cadmium Mass Loading



LEGEND

Sampling Location — Mass Load

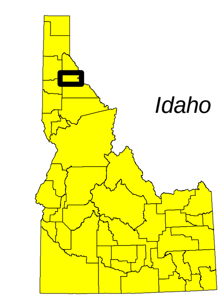
SF228 dCd: 0.5lbs/day 114.6cfs

Analyte — Flow in Cubic Feet per Second

Range of Total Cadmium Mass Loading in lbs/day

- Range 0 - 2.5
- Range 2.5 - 5
- Range 5 - 10
- Range 10 - 15
- Range >15

- Stream
- Interstate 90
- City
- Pine Creek Watershed
- Pine Creek Segment
- River Segment
- Lake/River
- Source Area



Location Map

NOTES

1) Base map coverages obtained from the Coeur d'Alene Tribe, URS Greiner Inc., CH2M HILL, and the Bureau of Land Management.

SCALE 1:60,000

0.5 0 0.5 Miles

027-RI-C0-102Q
Coeur d'Alene Basin RI/FS
RI REPORT

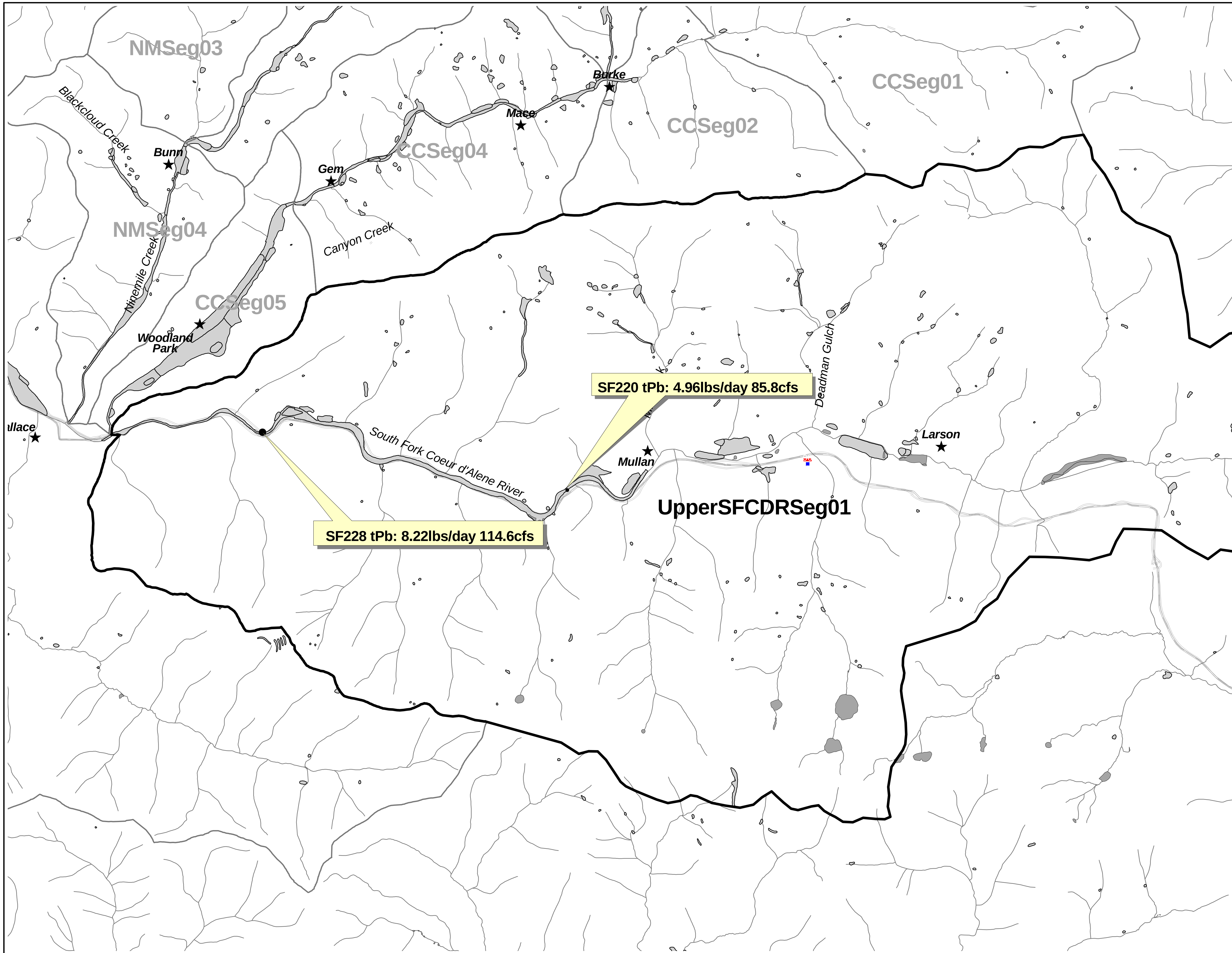
EPA REGION 10

Document Control 4162500.6615.05a
Generation 1
n:\Projects\watersheds\upper_south_fork\
usfcdr_ev7-13.apr
V:dCd Mass Loading
E:dCd
L: Final RI dCd Mass Loading
7/24/2001

This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: July 24, 2001

Figure 5.4-5
Upper South Fork Coeur d'Alene River Watershed Estimated Expected Values for Total Lead Mass Loading

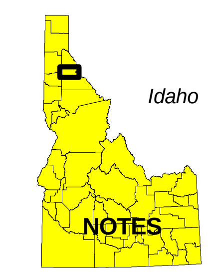


LEGEND

Sampling Location
Mass Load
SF228 tPb: 8.2lbs/day 114.6cfs
Analyte
Flow measured in Cubic Feet per Second

Range of Total Lead Mass Loading in lbs/day

- Range 0 - 5
- Range 5 - 10
- Range 10 - 50
- Range 50 - 100
- Range >100
- Stream
- Interstate 90
- City
- Upper south Fork Coeur d'Alene River Watershed
- Upper south Fork Coeur d'Alene River Watershed
- River Segment
- Lake/River
- Source Area



Location Map

1) Base map coverages obtained from the Coeur d'Alene Tribe, URS Greiner Inc., CH2M HILL, and the Bureau of Land Management.

SCALE 1:80,000

0.5 0 0.5 Miles

N

027-RI-C0-102Q
Coeur d'Alene Basin RI/FS
RI/FS REPORT

EPA REGION 10

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Generation 1
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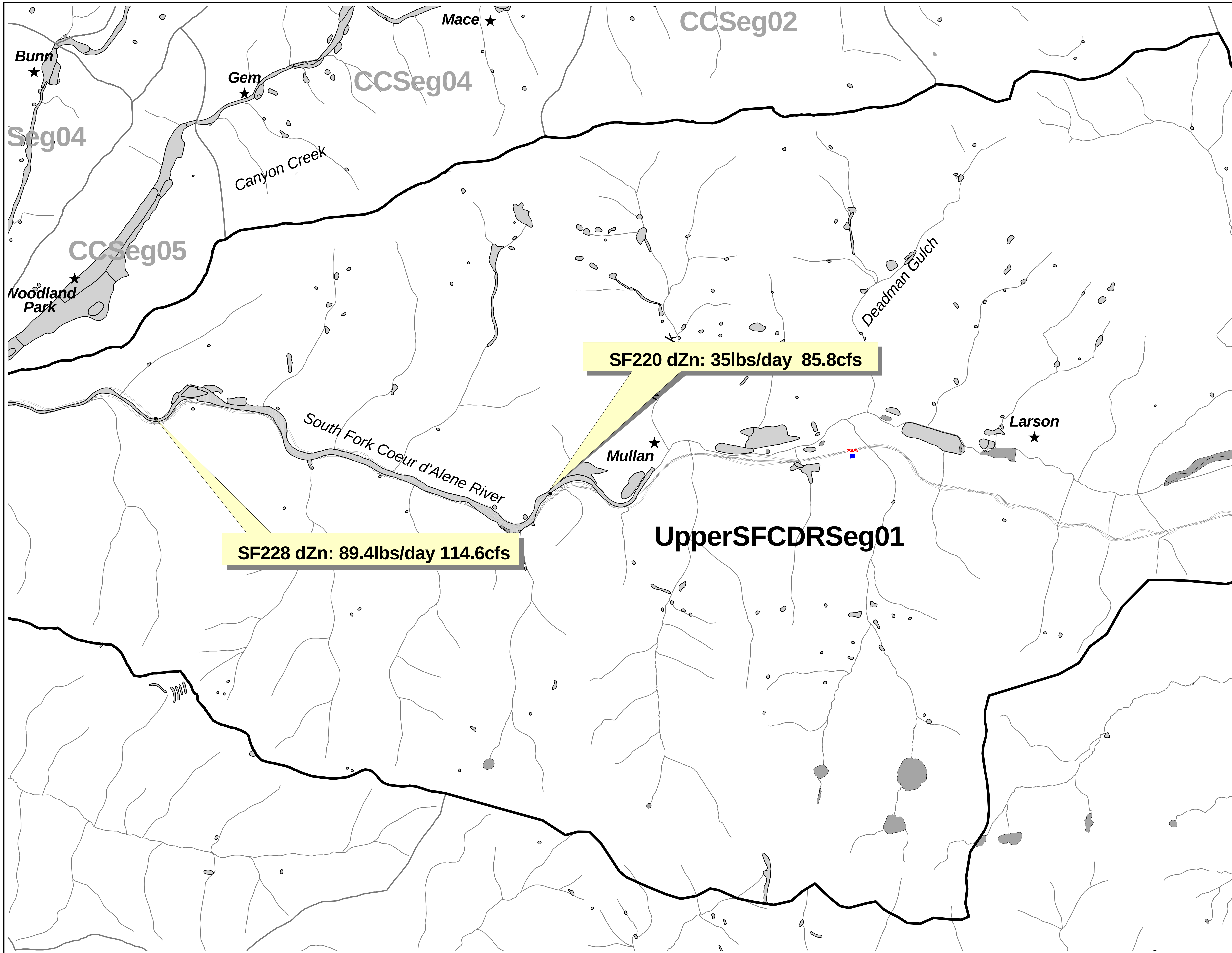
|pine_creekev_7-18.apr
V:tPb massloading
E:tPb
L: Final RI tPb Mass Loading
7/24/2001

This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: July 24, 2001

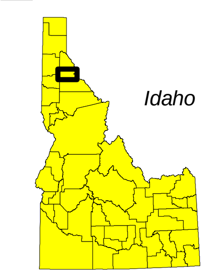
Figure 5.4-6
Upper South Fork Coeur d'Alene River Watershed Estimated Expected Values for Dissolved Zinc Mass Loading



LEGEND

Sampling Location
Mass Load
SF228 dZn: 89.4lbs/day 114.6cfs
Analyte
Flow measured in Cubic Feet per Second

Range of Dissolved Zinc Mass Loading in lbs/day
- Range 0 - 100
- Range 100 - 500
- Range 500 - 1000
- Range 1000 - 1500
- Range >1500
- Stream
- Interstate 90
- City
- Upper South Fork Coeur d'Alene River Watershed
- Upper South Fork Coeur d'Alene River Segment
- River Segment
- Lake/River
- Source Area



Location Map

NOTES

1) Base map coverages obtained from the Coeur d'Alene Tribe, URS Greiner Inc., CH2M HILL, and the Bureau of Land Management.

SCALE 1:60,000

0.5 0 0.5 Miles

N

027-RI-C0-102Q
Coeur d'Alene Basin RI/FS
RI REPORT

EPA REGION 10

Document Control 4162500.6615.05a
Generation 1
n:\Projects\watersheds\upper_south_fork\|usfcdr_ev7-13.apr
V:dZn Mass Loading
E:dZn
L: Final RI dZn Mass Loading
7/24/2001

This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: July 24, 2001

Table 5.1-1
Low and High Instantaneous Metal Loading Values for Six Sampling Events From May 1991 to May 1999

Metal	Low (pounds/day)	High (pounds/day)
Dissolved Cadmium	0.07	1.04
Total Lead	0.779	24.9
Dissolved Lead	0.13	0.61
Dissolved Zinc	1.69	6.9

Table 5.2-1
Estimated Expected Values of Concentrations and Loads Compared to Screening Levels and TMDLs for the South Fork Above Wallace

Sampling Location	Concentration (µg/L)			Mass Loading (pounds/day)			Discharge (cfs)
	Dissolved Cadmium	Total Lead	Dissolved Zinc	Dissolved Cadmium	Total Lead	Dissolved Zinc	
Screening Level or TMDL[a]	0.38	15	42	0.934	1.64	81.7	NA
SF220	**0.659** (0.545)	11.1 (0.593)	**130** (0.679)	0.219 (1.11)	**4.96** (1.65)	35.0 (0.666)	85.8 (1.39)
SF228	**1.07** (0.455)	9.21 (0.902)	**188** (0.741)	0.504 (1.05)	**8.22** (3.9)	**89.4** (1.23)	114.6 (1.32)

[a]TMDLs shown are for the South Fork at Wallace.

Notes:
NA - not applicable
Values in parentheses are coefficients of variation
µg/L - micrograms per liter
cfs - cubic feet per second
Bold indicates exceedance of screening level

Table 5.2-2
Estimated Gains or Losses (EV[X]) in Discharge

Reach - between location Xi and Xj (# of samples)	Estimated expected value of gain or loss (EV[X]) in discharge, cfs	Coefficient of variation (CV) for reach (pxi,xj = 0.9)
SF220 (41) to SF228 (47)	28.8	2.4

Note:
cfs - cubic feet per second

Table 5.2-3
Estimated Gains or Losses (EV[X]) for Dissolved Zinc Concentrations and Load

Reach - between location Xi and Xj (no. of samples)	Estimated expected value of increase or decrease in the concentration of dissolved zinc (µg/L)	Estimated coefficient of variation (CV) for the dissolved zinc (pxi,xj = 0.9)	Estimated expected value of gain or loss in the dissolved zinc load (lbs/day)	Estimated coefficient of variation (CV) for the dissolved zinc load (pxi,xj = 0.9)
SF220 (41) to SF228 (47)	58	1.2	54.4	1.6

Notes:
µg/L - micrograms per liter
lbs/day - pounds per day

Table 5.2-4
Estimated Gains or Losses (E[V]) for Total Lead Concentrations and Load

Reach - between location Xi and Xj (no. of samples)	Estimated expected value of increase or decrease in the total concentration of lead (µg/L)	Estimated Coefficient of variation (CV) for total lead concentrations	Estimated expected value of gain or loss in the total lead load (lbs/day)	Estimated coefficient of variation (CV) for the total lead load
SF220 (41) to SF228 (47)	-1.89	2.0	3.26	7.7

Notes:
µg/L - micrograms per liter
lbs/day - pounds per day

Table 5.2-5
Estimated Gains or Losses (E[V]) for Dissolved Cadmium Concentrations and Load

Reach - between location Xi and Xj (# of samples)	Estimated expected value of increase or decrease in the concentration of dissolved cadmium (µg/L)	Estimated coefficient of variation (CV) for the dissolved cadmium (pxi,xj = 0.9)	Estimated expected value of gain or loss in the dissolved cadmium load (lbs/day)	Estimated coefficient of variation (CV) for the dissolved cadmium load (pxi,xj = 0.9)
SF220 (41) to SF228 (47)	0.41	0.6	0.285	1.2

Notes:
µg/L - micrograms per liter
lbs/day - pounds per day

Table 5.4-1
Potential Major Source Areas in the Upper South Fork Watershed

Reach	Location Description	Associated Source Areas
Upstream of SF220	Headwaters to just downgradient of Mullan	Morning No. 6 Mine and Mill Gold Hunter No. 6 Lucky Friday Mine and Tailings Pond
SF220 to SF228	Downgradient of Mullan to downgradient of the Golconda Minesite	Grouse Gulch Mines Golconda Mine and Mill (Star 1200 Level and West Star Mine) Upper SFCDAR Impacted Floodplain

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ATTACHMENT 1
Data Source References

Data Source References

Data Source References[a]	Data Source Name	Data Source Description	Reference
2	URS FSPA Nos. 1, 2, and 3	Fall 1997: Low Flow and Sediment Sampling	URS Greiner Inc. 1997. Field Sampling Plan Addendum 1 Sediment Coring in the Lower Coeur d'Alene River Basin, Including Lateral Lakes and River Floodplains
			URS Greiner Inc. 1997. Field Sampling Plan Addendum 2 Adit Drainage, Seep and Creek Surface Water Sampling
			URS Greiner Inc. 1997. Field Sampling Plan Addendum 3 Sediment Sampling Survey in the South Fork of the Coeur d'Alene River, Canyon Creek, and Nine-Mile Creek
3	URS FSPA No. 4	Spring 1998: High Flow Sampling	URS Greiner Inc. 1998. Field Sampling Plan Addendum 4 Adit Drainage, Seep and Creek Surface Water Sampling; Spring 1998 High Flow Event
4	MFG Historical Data Spring 1991	Spring 1991: High Flow Sampling	McCulley, Frick & Gillman, Inc. 1991. Upstream Surface Water Sampling Program Spring 1991 High Flow Event, South Fork Coeur d'Alene River Basin above Bunker Hill Superfund Site: Tables 1 and 2
5	MFG Historical Data Fall 1991	Fall 1991: Low Flow Sampling	McCulley, Frick & Gillman, Inc. 1992. Upstream Surface Water Sampling Program Fall 1991 Low Flow Event, South Fork Coeur d'Alene River Basin above Bunker Hill Superfund Site: Tables 1 and 2
6	EPA/Box Historical Data	Superfund Site Groundwater and Surface Water Data	CH2MHill. 1997. Location of Wells and Surface Water Sites, Bunker Hill Superfund Site. Fax Transmission of Map August 11, 1998
			Environmental Protection Agency. 1998. E-mail from Ben Cope July 15, 1998. Subject: 2 Datasets File Attached: BOXDATA.WK4
7	IDEQ Historical Data	IDEQ Water Quality Data	Idaho Department of Environmental Quality. 1998. Assortment of files from Glen Pettit for water years 1993 through 1996
			Idaho Department of Environmental Quality. 1998. E-mail from Glen Pettit October 6, 1998 Subject: DEQ Water Quality Data Files Attached: 1998 trend Samples.xls, 1997 trend Samples.xls

Data Source References (Continued)

Data Source References[a]	Data Source Name	Data Source Description	Reference
8	EPA/NPDES Historical Data	Water Quality based on NPDES Program	Environmental Protection Agency. 1998. E-mail from Ben Cope August 11, 1998/September 2, 1998. Subject: Better PCS Data Files/Smelterville. Attached: PCS2.WK4, PCSREQ.698/TMT-PLAN.XLS
			Environmental Protection Agency. 1998. E-mail from Ben Cope August 5, 1998. Subject: State of Idaho Lat/Longs File Attached: PAT.DBF
			Environmental Protection Agency. 1998. E-mail from Ben Cope July 15, 1998. Subject: 2 Datasets File Attached: PCSDATA.WK4
10	URS FSPA No. 5	Common Use Areas Sampling	URS Greiner Inc. 1998. Field Sampling Plan Addendum 5 Common Use Areas: Upland Common Use Areas and Lower Basin Recreational Beaches; Sediment/Soil, Surface Water, and Drinking Water Supply Characterization
11	URS FSPA No. 8	Source Area Sampling	URS Greiner Inc. 1998. Field Sampling Plan Addendum 8 Tier 2 Source Area Characterization Field Sampling Plan
12	Historical Groundwater Data from MFG	1997 Annual Groundwater Data Report Woodland Park	McCulley, Frick & Gillman. 1998. 1997 Annual Groundwater Data Report Woodland Park
13	Historical Data from US Forest Service, Idaho Geological Survey and others	Historical Data on Inactive Mine Sites USFS, IGS and CCJM, 1994-1997, Prichard Creek, Pine Creek and Summit Mining District	Mackey K, Yarbrough, S.L. 1995. Draft Removal Preliminary Assessment Report Pine Creek Millsites, Coeur d'Alene District, Idaho, Contract No. 1422-N651-C4-3049
			Idaho Geological Survey. 1999. Site Inspection Report for the Abandoned and Inactive Mines in Idaho on U.S. Forest Service Lands (Region 1), Idaho Panhandle National Forest Vol. I, Prichard Creek and Eagle Creek Drainages
			Idaho Geological Survey. 1999. Site Inspection Report for the Abandoned and Inactive Mines in Idaho on U.S. Forest Service Lands (Region 1), Idaho Panhandle National Forest Vol. III, Coeur d'Alene River Drainage Surrounding the Coeur d'Alene Mining District (Excluding the Prichard Creek and Eagle Creek Drainages)
			Idaho Geological Survey. 1999. Site Inspection Report for the Abandoned and Inactive Mines in Idaho on U.S. Forest Service Lands (Region 1), Idaho Panhandle National Forest Vol. IV, Prichard Creek and Eagle Creek Drainages

Data Source References (Continued)

Data Source References[a]	Data Source Name	Data Source Description	Reference
13	Historical Data from US Forest Service, Idaho Geological Survey and others (continued)		Idaho Geological Survey. 1999. Site Inspection Report for the Abandoned and Inactive Mines in Idaho on U.S. Forest Service Lands (Region 1), Idaho Panhandle National Forest Vol. V, Coeur d'Alene River Drainage Surrounding the Coeur d'Alene Mining District (Excluding the Prichard Creek and Eagle Creek Drainages) Part 2 Secondary Properties
			US Forest Service. 1995. Pilot Inventory of Inactive and Abandoned Mine Lands, East Fork Pine Creek Watershed, Shoshone County, Idaho
14	Historical Sediment Core Data: University of Idaho (Thesis papers)	Historical Lateral Lakes Sediment Data from F. Rabbi and M.L. Hoffman	Characterization of Heavy Metal Contamination in Two Lateral Lakes of the Lower Coeur d'Alene River Valley, A thesis by M.L. Hoffmann, May 1995
			Trace Element Geochemistry of Bottom Sediments and Waters from the Lateral Lakes of Coeur d'Alene River, A Dissertation by F. Rabbi, May 1994
15	URS FSPA No. 9	Source Area Characterization; Field XRF Data	CH2M Hill and URS Greiner. 1998. Field Sampling Plan Addendum 9 Delineation of Contaminant Source Areas in the Coeur d'Alene Basin using Survey and Hyperspectral Imaging Techniques
16	Historical Sediment Data	Electronic Data compiled by USGS	U.S. Geological Survey. 1992. Effect of Mining-Related Activities on the Sediment-Trace Element Geochemistry of Lake Coeue d'Alene, Idaho, USA--Part 1: Surface Sediments, USGS Open-File Report 92-109, Prepared by A.J. Horowitz, K.A. Elrick, and R.B. Cook
			US Geological Survey. 2000. Chemical Analyses of Metal-Enriched Sediments, Coeur d'Alene Drainage Basin, Idaho: Sampling, Analytical Methods, and Results. Draft. October 13, 2000. Prepared by S.E. Box, A.A. Bookstrom, M. Ikramuddin, and J. Lindsey. Samples collected from 1993 to 1998.

Data Source References (Continued)

Data Source References[a]	Data Source Name	Data Source Description	Reference
17	USGS Spokane River Basin Sediment Samples	Surface Sediment Samples Collected by USGS in the Spokane River Basin	Environmental Protection Agency. 1999. Data Validation Memorandum and Attached Table from Laura Castrilli to Mary Jane Nearman dated June 9, 1999. Subject: Coeur d'Alene (Bunker Hill) Spokane River Basin Surface Sample Samples, USGS Metals Analysis, <63 um fraction, Data Validation, Samples SRH7-SRH30
18	USGS Snomelt Surface Water Data	Surface Water Data from 1999 Snomelt Runoff Hydrograph	USGS. 1999. USGS WY99.xls Spreadsheet dowloaded from USGS (Coeur d'Alene Office) ftp site
			USGS. 2000. Concentrations and Loads of Cadmium, Lead and Zinc Measured near the Peak of the 1999 Snomelt Runoff Hydrograph at 42 Stations, Coeur d'Alene River Basin Idaho
			USGS. 2000. Concentrations and Loads of Cadmium, Lead and Zinc Measured on the Ascending and Descending Limbs of the 1999 Snomelt Runoff Hydrograph at Nine Stations, Coeur d'Alene River Basin Idaho
22	MFG Report on Union Pacific Railroad Right-of-Way Soil Sampling	Surface and Subsurface Soil Lead Data	MFG. 1997. Union Pacific Railroad Wallace Branch, Rails to Trails Conversion, Right-of-Way Soil Sampling, Summary and Interpretation of Data. McCulley, Frick and Gilman, Inc. March 14, 1997
23	URS FSPA No. 11A	Source Area Groundwater and Surface Water Sampling	URS Greiner Inc. 1999. Field Sampling Plan Addendum 11A Tier 2 Source Area Characterization
24	URS FSPA No. 15	Common Use Area Sampling—Spokane River	URS Greiner Inc. 1999. Field Sampling Plan Addendum 15 Spokane River - Washington State Common Use Area Sediment Characterization
25	URS FSPA No. 18	Depositional and Common Use Area Sediment Sampling - Spokane River	URS Greiner Inc. 2001. Final Field Sampling Plan Addendum No. 18, Fall 2000 Field Screening of Sediment in Spokane River Depositional Areas, Summary of Results. Revision 1. January 2001.
28	USGS National Water Quality Assessment database	Surface water data for sampling location NF50 at Enaville, Idaho	USGS. 2001. USGS National Water Quality Assessment database: http://infotrek.er.usgs.gov/pls/nawqa/nawqa.wwv_main.gohome. Data retrieved on August 2, 2001 for station 12413000, NF Coeur d'Alene River At Enaville, Idaho.

[a]Reference Number is the sequential number used as cross reference to associate chemical results in data summary tables with specific data collection efforts.

ATTACHMENT 2
Data Summary Tables

ABBREVIATIONS USED IN DATA SUMMARY TABLE

LOCATION TYPES:

AD adit
BH borehole
FP flood plain
GS ground surface/near surface
HA hand auger boring
LK lake/pond/open reservoir
OF outfall/discharge
RV river/stream
SP stockpile
TL tailings pile

QUALIFIERS:

U Analyte was not detected above the reported detection limit
J Estimated concentration

DATA SOURCE REFERENCES:

Data source references listed in Attachment 1 are included in the data summary tables in the "Ref" column.

Data Summary Table
Upper South Fork - segment UpperSFCDRSeg01

Boxed Sample Results Exceed Screening Level By More Than 1X

Shaded Sample Results Exceed Screening Level By More Than 10X

Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Surface Soil (mg/kg)														
GOLCON	GS	3	05/19/1998	0	88	185	93.3	358	124000	* 33800	15900	26.4	96.5	13400
GOLCON	BH	3	05/19/1998	0	71.2	153	54.9	483	64300	* 26800	5380	3.7	114	12500
GOLCON	BH	3	05/19/1998	0	116	205	225	506	207000	* 37500	27700	37.2	81.1	* 39400
GOLCON	BH	3	05/19/1998	0	14	140	17.7	135	38200	4120	2800	6	11.8	2460
GOLCON	BH	3	05/19/1998	0	226	93.1	56.6	545	41300	* 23900	3420	10	119	10100
GOLCON	BH	3	05/19/1998	0	17.7	418	60.5	974	18100	7970	2050	5.4	31.6	8500
GOLCON	BH	3	05/19/1998	0	* 3150	* 3010	4.5	31.7	29700	541	185	0.2	8.6	80.8
GOLCON	BH	3	05/19/1998	0	155	139	21.2	499	41500	* 65700	1110	14.2	145	2390
LC10022	RV	22	---	0.5						15500				
LC10023	RV	22	---	0.5						12300				
LC10024	RV	22	---	0.5						* 21600				
LC10025	RV	22	---	0.5						* 24100				
LC10026	RV	22	---	0.5						15200				
LC10087	RV	22	---	0.5						6610				
LC10088	RV	22	---	0.5						3840				
LC10089	RV	22	---	0.5						2650				
LC10090	RV	22	---	0.5						1710				
LC10091	RV	22	---	0.5						3700				
LC10092	RV	22	---	0.5						3150				
LC10093	RV	22	---	0.5						9400				
LC10094	RV	22	---	0.5						2700				
LC10095	RV	22	---	0.5						* 33500				
LC10096	RV	22	---	0.5						7840				
SF401	GS	11	12/21/1998	0	19.7 J	42.1	11.9	954	29700	4570		0.9	19.2	1820
SF401	GS	11	12/21/1998	0							2130			
SF402	GS	11	12/21/1998	0	20.3 J	35.4	13.8	210	33200	4080	2100	1.6	15.6	2880
SF403	GS	11	12/21/1998	0	16.5 J	28.2	1.1	3100	22600	245	864	0.13	12.6	324
SF404	GS	11	12/21/1998	0	1.5 J	5.6	0.55 J	12.7	12900	234	2750	0.05 J	0.94 J	97.2
SF405	GS	11	12/21/1998	0	1.2 J	6.7	0.51 J	11	12500	228	2670	0.07 J	0.69 J	89.7
SF8164	TL	13	---			85 U	1.8	52	12000	640	690			620
SF8165	TL	13	---			85 U	6.6	1400	19000	1500	1800			1700
SF8166	TL	13	---			85 U	0.78	130	4400	160	930			15
SF8167	TL	13	---			85	7.7	1900	190000	150	7500			97
SF8267	TL	13	---			92	5.2	70	77000	* 21000	4200			60
SF8268	TL	13	---			160	82	240	65000	* 20000	9500			11000
SF8269	TL	13	---			140	3.3	68	31000	78	840			120

Data Summary Table
Upper South Fork - segment UpperSFCDRSeg01

Boxed Sample Results Exceed Screening Level By More Than 1X

Shaded Sample Results Exceed Screening Level By More Than 10X

Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Subsurface Soil (mg/kg)														
GOLCON	BH	3	05/19/1998	0.5	42.4	127	90.8	360	86500	* 24500	9840	8.9	68.7	16200
GOLCON	BH	3	05/19/1998	1	29.6	152	88.6	467	88200	* 25300	7920	8.8	68.4	15200
GOLCON	BH	3	05/19/1998	0.5	105	184	397	329	210000	* 34800	26500	51.5	72.4	* 58300
GOLCON	BH	3	05/19/1998	1	164	231	543	341	225000	* 52200	27500	35.6	118	* 83900
GOLCON	BH	3	05/19/1998	0.5	15.3	145	26.2	149	43300	7010	3750	6.9	16.2	3560
GOLCON	BH	3	05/19/1998	1	7	124	31.1	136	55100	4590	4130	4.8	13.3	4090
GOLCON	BH	3	05/19/1998	0.5	186	265	132	622	192000	* 46300	23400	37.6	120	21000
GOLCON	BH	3	05/19/1998	1	68.1	311	138	400	205000	* 39800	26500	25.6	75.6	25300
GOLCON	BH	3	05/19/1998	0.5	43.8	485	79.6	613	22400	11600	4670	9.8	51.5	6980
GOLCON	BH	3	05/19/1998	1	44	141	25.6	552	97100	* 17600	15500	16.2	50.6	3660
GOLCON	BH	3	05/19/1998	0.08	885	* 2760	5.1	27.1	23600	729	329	0.26	16.3	140
GOLCON	BH	3	05/19/1998	0.5	1110	* 2560	3.2	25.7	29000	345	139	0.13	3.8	90.6
GOLCON	BH	3	05/19/1998	1	1700	* 2940	3.3	22.2	25500	279	102	0.06 U	2.7	62.6
GOLCON	BH	3	05/19/1998	0.5	52	134	16.1	491	60800	* 23600	3080	14.8	65.9	4030
GOLCON	BH	3	05/19/1998	1	67.3	118	42.1	658	54400	* 26800	2610	18.4	68.8	7680
LC10022	RV	22	---	1						12800				
LC10022	RV	22	---	1.5						4320				
LC10023	RV	22	---	1						9470				
LC10023	RV	22	---	1.5						2620				
LC10024	RV	22	---	1						* 25500				
LC10024	RV	22	---	1.5						6890				
LC10025	RV	22	---	1						* 28100				
LC10025	RV	22	---	1.5						7150				
LC10026	RV	22	---	1						* 22800				
LC10026	RV	22	---	1.5						* 21900				
LC10087	RV	22	---	1						4260				
LC10087	RV	22	---	1.5						2250				
LC10088	RV	22	---	1						8120				
LC10088	RV	22	---	1.5						12200				
LC10089	RV	22	---	1						1750				
LC10089	RV	22	---	1.5						4480				
LC10090	RV	22	---	1						1500				
LC10090	RV	22	---	1.5						1670				
LC10091	RV	22	---	1						4790				
LC10091	RV	22	---	1.5						5260				
LC10092	RV	22	---	1						2750				
LC10092	RV	22	---	1.5						1720				

Data Summary Table
Upper South Fork - segment UpperSFCDRSeg01

Boxed Sample Results Exceed Screening Level By More Than 1X

Shaded Sample Results Exceed Screening Level By More Than 10X

Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Subsurface Soil (mg/kg)														
LC10093	RV	22	---	1						9730				
LC10093	RV	22	---	1.5						8860				
LC10094	RV	22	---	1						2590				
LC10094	RV	22	---	1.5						3580				
LC10095	RV	22	---	1						* 33000				
LC10095	RV	22	---	1.5						* 34500				
LC10096	RV	22	---	1						8560				
LC10096	RV	22	---	1.5						6100				
Sediment (mg/kg)														
GOLCON	GS	3	05/19/1998	0	50	214	112	245	124000	* 21500	13400	* 26	54.3	16300
SF522	HA	2	12/14/1997	0	9.08 UJ	15.1 J	21.8	109	53100	4610	4900 J	0.234 J	9.72	5570 J
SF523	HA	2	12/14/1997	0	4.07 UJ	9.62 J	7.1	98.3	55300	* 5270	6030 J	0.72 J	12	2530 J
SF524	HA	2	12/14/1997	0	3.11 U	11 J	2.58	39.7	18200	726	1310 J	0.31 J	2.96	439 J
SF525	HA	2	12/14/1997	0	2.33 UJ	10.1 J	3.83	92.9	21000	611	1600 J	0.225 J	2.25	1180 J
SF526	HA	2	12/15/1997	0	5.24 UJ	11 J	2.49	124	42500	1850	3880 J	0.199 J	5.81	1890 J
SF526	HA	2	12/15/1997	0.17	0.948 J	9.93 J	4.56	104	33700	1230	3070 J	0.537 J	4.38	1630 J
SF528	HA	2	12/15/1997	0	2.7 UJ	8.95 J	2.89	92.5	33400	861	2700 J	0.146 J	3.42	1510 J
SF529	HA	2	12/15/1997	0	4.54 UJ	18 J	5.92	139	28300	666	1430 J	0.154 J	3.15	1820 J
SF530	HA	2	12/15/1997	0	1.12 U	3.19 J	1.61	61.5	6160	527	391 J	0.0533 J	0.896 J	305 J
SF531	HA	2	12/15/1997	0	1.01 U	15.7 J	0.873 J	165	18800		1420 J		1.85 J	
SF531	HA	2	12/15/1997	0						200 J		0.0794 J		636 J
SF533	HA	2	12/15/1997	0	3.19 U	10.3 J	1.17 J	228 J	12800	114 J	1960	0.0728 J	3.76	428 J
SF534	HA	2	12/15/1997	0	7.51 U	24.4 J	2.66 J	283 J	15000	361 J	3060	0.268	4.62	560 J
SF535	TP	2	12/16/1997	1	1.36 U	18.8 J	4.23 J	34.1 J	23900	1190 J	1730	0.556	2.31 J	1060 J
SF536	TP	2	12/16/1997	0	14.7 J	28.4 J	81 J	91.9 J	121000	* 13800 J	15700	3.55	24.9	13700 J
SF537	TP	2	12/16/1997	1	26.9 J	84.2 J	40.2 J	85.9 J	129000	* 23500 J	13500	3.36	31.3	6240 J
SF538	TP	2	12/16/1997	1.5	1.03 U	4.8 J	0.067 J	12.9 J	11500	36.1 J	501	0.065 J	0.303 J	195 J
SF539	TP	2	12/16/1997	0	0.996 U	4.43 J	0.143 J	16.2 J	10700	31.1 J	628	0.0515 U	0.226 J	471 J
SF540	TP	2	12/16/1997	2	1.01 U	10.3 J	0.0774 J	9.81 J	8880	35.3 J	447	0.0558 J	0.17 J	58.7 J
Surface Water - Total Metals (ug/l)														
SF10	RV	5	10/03/1991				1			6				293
SF201	RV	2	11/11/1997		0.75 U	1.4 J	0.069 U	0.39 J	16.6 U	0.41 J	2 J	0.1 U	0.22 U	26.1 U
SF201	RV	3	05/09/1998		0.72	1 U	0.62	3 U	80	3.7	6.3	0.2 UJ	0.3 U	120
SF202	RV	2	11/11/1997		0.25 U	0.27 UJ	0.069 U		5 U	0.19 J	1 J	0.1 U	0.22 U	

Data Summary Table
Upper South Fork - segment UpperSFCDRSeg01

Boxed Sample Results Exceed Screening Level By More Than 1X

Shaded Sample Results Exceed Screening Level By More Than 10X

Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Surface Water - Total Metals (ug/l)														
SF202	RV	2	11/11/1997					0.54 J						10.5 U
SF202	RV	18	05/22/1999						20		2			
SF202	RV	3	05/09/1998		0.5 U	1 U	0.1 U	3 U	31.2	0.5 U	5 U	0.2 UJ	0.3 U	5 U
SF204	RV	2	11/10/1997		0.05 U	0.16 U	0.069 U	0.14 U	5 U	0.026 U	1.1 J	0.1 U	0.22 U	12.2 U
SF204	RV	3	05/09/1998		0.5 U	1 U	0.1 U	3 U	141	4.4	42.2	0.2 UJ	0.3 U	9.5
SF205	RV	2	11/10/1997		0.2 U	0.22	0.069 U	0.2 U	52.9 J	0.27 J	12.1	0.1 U	0.22 U	18.4 U
SF205	RV	4	05/16/1991				0.2 U			3 U				20 U
SF205	RV	5	10/04/1991				0.2 U			1				**42**
SF205	RV	7	10/26/1993				0.25 U			7				16
SF205	RV	7	11/30/1993				0.25 U			6				5.7 J
SF205	RV	7	12/16/1993				0.25 U			2.5 U				**59.3**
SF205	RV	7	01/19/1994				**2.5**			2.5 U				28.5
SF205	RV	7	02/15/1994				**2.5**			2.5 U				11
SF205	RV	7	03/07/1994				0.25 U			2.5 U				25
SF205	RV	7	03/23/1994				0.25 U			2.5 U				5 U
SF205	RV	7	04/06/1994				0.25 U			2.5 U				5 U
SF205	RV	7	04/18/1994				0.25 U			6				12
SF205	RV	7	05/03/1994				0.25 U			6				11
SF205	RV	7	05/20/1994				0.25 U			10				12
SF205	RV	7	06/08/1994				0.25 U			2.5 U				15
SF205	RV	7	06/24/1994				0.25 U			2.5 U				**61**
SF205	RV	7	07/23/1994				0.25 U			6				14
SF205	RV	7	08/16/1994				0.25 U			2.5 U				17
SF205	RV	7	09/09/1994				0.25 U			2.5 U				15
SF205	RV	7	10/05/1994				0.25 U			2.5 U				**39**
SF205	RV	7	11/15/1994				0.25 U			2.5 U				5 U
SF205	RV	7	12/14/1994				0.25 U			2.5 U				16
SF205	RV	7	01/11/1995				0.25 U			8				18
SF205	RV	7	02/10/1995				0.25 U			2.5 U				17
SF205	RV	7	03/08/1995				0.25 U			2.5 U				18
SF205	RV	7	03/22/1995				0.25 U			2.5 U				29
SF205	RV	7	04/12/1995				0.25 U			2.5 U				10 J
SF205	RV	7	04/25/1995				0.25 U			2.5 U				11
SF205	RV	7	05/09/1995				0.25 U			2.5 U				24
SF205	RV	7	05/23/1995				0.25 U			2.5 U				10 J
SF205	RV	7	06/13/1995				1			2.5 U				20
SF205	RV	7	06/28/1995				0.25 U			2.5 U				10 J

Data Summary Table
Upper South Fork - segment UpperSFCDRSeg01

Boxed Sample Results Exceed Screening Level By More Than 1X

Shaded Sample Results Exceed Screening Level By More Than 10X

Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Surface Water - Total Metals (ug/l)														
SF205	RV	7	07/12/1995				0.25 U			2.5 U				13
SF205	RV	7	07/26/1995				0.25 U			2.5 U				10 J
SF205	RV	7	08/15/1995				0.25 U			2.5 U				13
SF205	RV	7	09/14/1995				0.25 U			2.5 U				5 U
SF205	RV	18	05/22/1999							2				10
SF205	RV	18	05/25/1999						**920**	11	**94**			30
SF205	RV	3	05/11/1998		0.2 U	2 U	0.2 U	2 U	132	3.6	13	0.2 U	0.2 U	10 U
SF206	RV	2	11/10/1997		2.7	0.6	0.069 U	**5.7**	5 U	0.13 J	1 U	0.29 U	0.22 U	9.5 U
SF206	RV	3	05/08/1998		4	2 U	0.2 U	**11**	28	1.3	5 U	0.2 U	0.2 U	10 U
SF207	RV	2	11/10/1997		1.3 U	0.31	0.069 U	**2.5 J**	5 U	0.097 J	1.2 J	0.1 U	0.22 U	9.8 U
SF207	RV	3	05/08/1998		1	2 U	0.2 U	**3**	20 U	0.2	5 U	0.2 U	0.2 U	10 U
SF208	RV	2	11/10/1997		1.1 U	0.47	0.069 U	0.93 J	103	2.3	**127**	0.1 U	0.22 U	24.2 U
SF208	RV	4	05/16/1991				0.2 U			3 U				20 U
SF208	RV	5	10/04/1991				0.2 U			2				12 U
SF208	RV	18	10/22/1998				1 UJ			1 UJ				10
SF208	RV	18	10/22/1998				1 UJ			1 UJ				10
SF208	RV	18	11/16/1998				1			10				**60**
SF208	RV	18	12/14/1998				1 UJ			7				30
SF208	RV	18	01/20/1999				1			4				20
SF208	RV	18	03/22/1999				1 UJ			24 UJ				**50**
SF208	RV	18	04/19/1999				1 UJ			5				30
SF208	RV	18	05/05/1999						70	2	**56**			10
SF208	RV	18	05/22/1999						250	4	**73**			10
SF208	RV	18	05/25/1999						**870**	13	**170**			20
SF208	RV	18	05/27/1999						**330**	5	**62**			10
SF208	RV	18	05/31/1999						160	2	39			10
SF208	RV	18	06/16/1999							3				10
SF208	RV	18	07/12/1999				0.1 U			1.8				4.4
SF208	RV	18	08/12/1999				0.1 U			1.4				6.7
SF208	RV	18	08/31/1999				0.1 U			1.3				8.2
SF208	RV	3	05/09/1998		0.5 U	1 U	0.1 U	3 U	75	2.7	27.5	0.2 UJ	0.3 U	7
SF209	RV	2	11/10/1997		3	0.91	0.069 U	**1.1 J**	5 U	1.2	1.3 J	0.1 U	0.22 U	13.3 U
SF209	RV	3	05/08/1998		1	2 U	0.2 U	**3**	32	3.1	5 U	0.2 U	0.2 U	10 U
SF209	RV	3	05/19/1998		0.43 U	0.27 J	0.041 U	0.56 J	85.3 J	0.66 J	38.5 J	0.16 U	0.042 U	4.7 J
SF210	RV	2	11/10/1997		0.27 U	0.22 J	0.069 U	0.56 U	5 U	0.24 J	1 U	0.1 U	7.2	11.1 U
SF210	RV	3	05/08/1998		0.2 U	2 U	0.2 U	**2**	44	0.5	5 U	0.2 U	0.2 U	10 U
SF211	RV	2	11/09/1997				0.29 U	0.37 U	5 U	0.38 J	1.4 J	0.1 U	0.22 U	

Data Summary Table
Upper South Fork - segment UpperSFCDRSeg01

Boxed Sample Results Exceed Screening Level By More Than 1X	Shaded Sample Results Exceed Screening Level By More Than 10X	Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Surface Water - Total Metals (ug/l)														
SF211	RV	2	11/09/1997		0.46 U	0.63 U								31.8 U
SF211	RV	3	05/08/1998		0.2 U	2 U	0.2 U	2 U	30	1.5	5 U	0.2 U	0.2 U	10 U
SF212	RV	2	11/09/1997		3.5 J	0.43 U	**2.9**	0.81 J	6.1 U	12.6	1.8 J	0.1 U	0.22 U	13.9 U
SF212	RV	3	05/08/1998		2.5	2 U	0.2 U	**8**	20 U	2.7	5 U	0.2 U	0.2 U	10 U
SF213	RV	2	11/10/1997		0.29 U	0.16 U	0.069 U	0.15 U	10 J	0.19 J	3.4 J	0.1 U	7.7	13.4 U
SF213	RV	3	05/08/1998		0.2 U	2 U	0.2 U	2 U	38	0.9	7	0.2 U	0.2 U	10 U
SF214	RV	2	11/09/1997		0.17 U	0.16 U	0.069 U	0.36 U	9.9 U	0.33 J	2.6 J	0.1 U	0.22 U	29.5 U
SF214	RV	3	05/11/1998		0.2 U	2 U	0.2 U	2 U	28	0.7	5 U	0.2 U	0.2 U	10 U
SF215	RV	2	11/09/1997		4 J	0.32 U	**4.4**	**1.6 J**	48.7 U	**32.8**	**60.2**	0.1 U	0.22 U	28.2 U
SF215	RV	4	05/15/1991				0.2 U			3 U				20 U
SF215	RV	5	10/04/1991				0.2 U			2				16
SF215	RV	3	05/10/1998		0.032 U	0.31 J	0.042 U	1 J	94.5 J	3.4	18.9	0.16 U	0.042 U	9.1 J
SF216	RV	2	11/09/1997		0.67 U	0.2 U	0.16 U	0.5 U	23.1 U	1.3	5.8 J	0.1 U	0.22 U	**47.5**
SF218	RV	2	11/09/1997		**19**	1.8 J	0.92	0.46 J	5 UJ	7	17.8	0.1 U	0.22 UJ	**202**
SF218	RV	3	05/08/1998		0.9	2 U	0.9	**3**	23	5	6	0.2 U	0.2 U	**156**
SF219	RV	2	11/08/1997		0.05 U	0.34 J	0.069 U	0.06 U	5 UJ	0.17 J	1 U	0.1 U	0.22 UJ	14.4 U
SF219	RV	3	05/06/1998		0.5 U	1 U	0.1 U	3 U	81.8 U	0.85	11.5	0.32	0.3 U	5 U
SF220	RV	2	11/08/1997		2.1 J	0.5 J	0.56	**1.4 J**	39.4 UJ	8.4	**81.6**	0.1 U	0.22 UJ	**146**
SF220	RV	4	05/15/1991				0.2			7				**51**
SF220	RV	5	10/04/1991				0.6			**26**				**207**
SF220	RV	7	10/26/1993				0.8			8				**176**
SF220	RV	7	11/30/1993				0.7			**18**				**174**
SF220	RV	7	12/20/1993				0.8			9				**207**
SF220	RV	7	01/19/1994				0.6			11				**172**
SF220	RV	7	02/15/1994				0.7			13				**187**
SF220	RV	7	03/07/1994				0.5 J			9				**118**
SF220	RV	7	03/23/1994				0.6			9				**135**
SF220	RV	7	04/06/1994				0.5 J			10				**81**
SF220	RV	7	04/18/1994				0.25 U			**21**				**46**
SF220	RV	7	05/03/1994				0.5 J			5 J				**58**
SF220	RV	7	05/20/1994				0.7			**63**				**57**
SF220	RV	7	06/08/1994				0.25 U			9				**66**
SF220	RV	7	06/24/1994				0.6			7				**94**
SF220	RV	7	07/23/1994				0.7			11				**146**
SF220	RV	7	08/16/1994				**2.2**			14				**175**
SF220	RV	7	09/09/1994				0.6			6				**158**
SF220	RV	7	10/05/1994				1			6				**201**

Data Summary Table
Upper South Fork - segment UpperSFCDRSeg01

Boxed Sample Results Exceed Screening Level By More Than 1X

Shaded Sample Results Exceed Screening Level By More Than 10X

Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Surface Water - Total Metals (ug/l)														
SF220	RV	7	11/15/1994				1			7				**192**
SF220	RV	7	12/14/1994				1.1			7				**218**
SF220	RV	7	01/11/1995				0.7			12				**122**
SF220	RV	7	02/10/1995				0.6			7				**114**
SF220	RV	7	03/08/1995				0.6			6				**118**
SF220	RV	7	03/22/1995				1			5 J				**214**
SF220	RV	7	04/12/1995				1.2			7				**113**
SF220	RV	7	04/25/1995				0.5 J			7				**80**
SF220	RV	7	05/08/1995				1.1			**18**				**85**
SF220	RV	7	05/23/1995				0.9			10				**67**
SF220	RV	7	06/13/1995				0.6			6				**70**
SF220	RV	7	06/28/1995				0.25 U			6				**72**
SF220	RV	7	07/12/1995				0.5 J			8				**93**
SF220	RV	7	07/26/1995				1			6				**115**
SF220	RV	7	08/15/1995				0.6			**16**				**138**
SF220	RV	7	09/14/1995				0.7			8				**164**
SF220	RV	3	05/10/1998		0.43 J	0.41 J	0.17 J	1 J	92.3 J	5.8 J	23.5 U	0.16 U	0.042 U	**38.8**
SF221	RV	2	11/08/1997				0.069 U				1 U	0.1 U	0.22 UJ	
SF221	RV	2	11/08/1997		0.05 U	0.2 J		0.16 J	5 UJ	0.12 J				8.1 U
SF221	RV	3	05/06/1998		0.5 U	1 U	0.1 U	3 U	30.5 U	0.5 U	5 U	0.2 U	0.3 U	5 U
SF222	RV	2	11/08/1997		0.05 U	0.16 U	0.069 U	0.06 U	5 UJ	0.15 J	1 U	0.1 U	0.22 UJ	7.4 U
SF222	RV	3	05/06/1998		0.5 U	1 U	0.1 U	3 U	20 U	0.5 U	5 U	0.2 U	0.3 U	5 U
SF223	RV	2	11/08/1997		3.1 J	0.41 J	**7.3**	0.24 J	5 UJ	9.5	3.1 U	0.1 U	0.22 UJ	**1440**
SF223	RV	7	04/24/1998				**7**			**460**				**805**
SF223	RV	7	05/28/1998				**3.9**			**38**				**587**
SF223	RV	7	06/25/1998				**4.9**			**22**				**727**
SF223	RV	7	07/27/1998				**6.4**			**25**				**623**
SF223	RV	7	08/25/1998				**7.6**			**23**				**958**
SF223	RV	7	09/23/1998				**8**			**27**				**1080**
SF223	RV	7	10/27/1998				**11**			**24**				**1540**
SF223	RV	7	11/24/1998				**16**			**32**				**2340**
SF223	RV	7	12/31/1998				**12**			**32**				**1590**
SF223	RV	7	01/14/1999				**10**			**34**				**1470**
SF223	RV	7	02/22/1999				**10**			**19**				**1360**
SF223	RV	7	03/09/1999				**14**			**23**				**1400**
SF223	RV	3	05/06/1998		0.5 U	1 U	**8.8**	3 U	20 U	12.2	7.5	0.2 U	0.3 U	**1370**
SF224	RV	2	11/08/1997		0.92 U	0.32 J	0.069 U	0.73 J	5 UJ	10.5	1.2 U	0.1 U	0.22 UJ	10.3 U

Data Summary Table
Upper South Fork - segment UpperSFCDRSeg01

Boxed Sample Results Exceed Screening Level By More Than 1X

Shaded Sample Results Exceed Screening Level By More Than 10X

Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Surface Water - Total Metals (ug/l)														
SF224	RV	3	05/06/1998		0.5 U	1 U	0.1 U	3 U	38 U	**24.7**	6	0.2 U	0.3 U	5 U
SF225	RV	2	11/07/1997		0.42 U	0.16 U	0.069 U	0.47 J	76.4 UJ	0.1 J	1 U	0.1 U	0.22 UJ	9.6 U
SF225	RV	3	05/05/1998		0.2 U	2 U	0.2 U	2 U	51	0.2 U	5 U	0.2 U	0.2 U	10 U
SF226	RV	2	11/07/1997		0.18 U	0.16 U	0.069 U	0.19 J	10 U	1.7	4.6 J	0.1 UJ	0.22 U	14.7 J
SF226	RV	3	05/05/1998		0.2 U	2 U	0.2 U	2 U	65	1.8	5 U	0.2 U	0.2 U	10 U
SF227	RV	2	11/07/1997		1.8 U	0.28	0.79	**1.2**	51 J	11	**50.6**	0.1 U	0.22 U	**168**
SF227	RV	4	05/15/1991				0.4			7				**86**
SF227	RV	5	10/04/1991				0.9			12				**249**
SF227	RV	18	05/24/1999				1		**1000**	**85**	**340**			**130**
SF227	RV	3	05/10/1998		0.24 J	0.57 J	0.36 J	**1.1 J**	93.5 J	6	21.7	0.16 U	0.042 U	**66.9**
SF228	RV	2	11/07/1997		1.9 U	0.37	0.88	**1.2**	193	7.3	**60.9**	0.1 U	0.22 U	**225**
SF228	RV	4	05/16/1991				0.4			10				**95**
SF228	RV	5	10/04/1991				0.7			11				**291**
SF228	RV	7	10/26/1993				1.1			5 J				**228**
SF228	RV	7	11/30/1993				1.2			11				**245**
SF228	RV	7	12/20/1993				**2.5**			1 U				**251**
SF228	RV	7	01/19/1994				1			2.5 U				**193**
SF228	RV	7	02/15/1994				0.9			7				**217**
SF228	RV	7	03/07/1994				0.9			8				**192**
SF228	RV	7	03/23/1994				1			6				**218**
SF228	RV	7	04/06/1994				0.8			12				**156**
SF228	RV	7	04/18/1994				1.2			**52**				**162**
SF228	RV	7	05/03/1994				0.6			7				**93**
SF228	RV	7	05/20/1994				0.9			15				**110**
SF228	RV	7	06/08/1994				0.7			6				**132**
SF228	RV	7	06/24/1994				0.8			7				**124**
SF228	RV	7	07/23/1994				1			2.5 U				**164**
SF228	RV	7	08/16/1994				1.6			7				**232**
SF228	RV	7	09/09/1994				0.9			6				**201**
SF228	RV	7	11/15/1994				1.2			2.5 U				**284**
SF228	RV	7	12/14/1994				1.7			8				**326**
SF228	RV	7	01/11/1995				1.1			15				**233**
SF228	RV	7	02/10/1995				0.9			6				**218**
SF228	RV	7	03/22/1995				1			2.5 U				**194**
SF228	RV	7	04/12/1995				1.4			7				**163**
SF228	RV	7	04/25/1995				0.8			9				**143**
SF228	RV	7	05/08/1995				1.9			**16**				**109**

Data Summary Table
Upper South Fork - segment UpperSFCDRSeg01

Boxed Sample Results Exceed Screening Level By More Than 1X	Shaded Sample Results Exceed Screening Level By More Than 10X	Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Surface Water - Total Metals (ug/l)														
SF228	RV	7	05/23/1995				1.2			10				**105**
SF228	RV	7	06/13/1995				0.9			6				**108**
SF228	RV	7	06/28/1995				0.7			2.5 U				**117**
SF228	RV	7	07/12/1995				0.9			7				**131**
SF228	RV	7	07/26/1995				1			2.5 U				**177**
SF228	RV	7	08/15/1995				1			5 J				**217**
SF228	RV	7	09/14/1995				1.1			5 J				**212**
SF228	RV	7	10/18/1995				0.9			14				**181**
SF228	RV	7	11/22/1995				0.9			7				**142**
SF228	RV	7	12/27/1995				1.3			7				**243**
SF228	RV	7	01/17/1996				1.1			8				**223**
SF228	RV	7	02/29/1996				0.9			8				**219**
SF228	RV	7	03/27/1996				0.8			5 J				**193**
SF228	RV	7	04/17/1996				0.6			12				**166**
SF228	RV	7	05/08/1996				0.8			11				**160**
SF228	RV	7	06/19/1996				1			13				**144**
SF228	RV	7	07/23/1996				1.1			11				**145**
SF228	RV	7	08/21/1996				1			14				**210**
SF228	RV	7	09/26/1996				1.2			8				**235**
SF228	RV	7	10/29/1996				1.1			8				**219**
SF228	RV	7	11/26/1996				1.2			8				**277**
SF228	RV	7	12/17/1996				1.3			6				**330**
SF228	RV	7	01/29/1997				1.1			10				**227**
SF228	RV	7	03/27/1997				1.5							**256**
SF228	RV	7	04/17/1997				1.8			12				**214**
SF228	RV	7	05/15/1997				**3.3**			**588**				**485**
SF228	RV	7	06/25/1997				0.25			9				**101**
SF228	RV	7	07/24/1997				0.7			8				**139**
SF228	RV	7	08/13/1997				0.9			10				**174**
SF228	RV	7	09/04/1997				1.4			11				**223**
SF228	RV	7	10/17/1997				1.5			11				**262**
SF228	RV	7	11/25/1997				1			8				**207**
SF228	RV	7	12/18/1997				1.2			13				**225**
SF228	RV	7	01/22/1998				1.2			9				**243**
SF228	RV	7	02/26/1998				1.2			11				**254**
SF228	RV	7	03/19/1998				1			14				**224**
SF228	RV	7	04/24/1998				1.4			**52**				**150**

Data Summary Table
Upper South Fork - segment UpperSFCDRSeg01

Boxed Sample Results Exceed Screening Level By More Than 1X

Shaded Sample Results Exceed Screening Level By More Than 10X

Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Surface Water - Total Metals (ug/l)														
SF228	RV	7	04/24/1998				1.2			**52**				**127**
SF228	RV	7	05/28/1998				0.6			8				**98**
SF228	RV	7	06/25/1998				0.9			5				**154**
SF228	RV	7	07/27/1998				1			10				**148**
SF228	RV	7	08/25/1998				1			7				**175**
SF228	RV	7	09/23/1998				1.2			12				**203**
SF228	RV	7	10/27/1998				1.1			8				**260**
SF228	RV	7	11/24/1998				**2.1**			15				**282**
SF228	RV	7	12/31/1998				**2.2**			**27**				**274**
SF228	RV	7	02/22/1999				1.3			9				**193**
SF228	RV	7	03/09/1999				**3.2**			9				**242**
SF228	RV	3	05/10/1998					0.98 J				0.16 U	0.042 U	**67.5**
SF228	RV	3	05/10/1998		0.3 J	0.34 J	0.32 J		84.3 J	5.1	19.1			
SF229	RV	2	11/07/1997		0.3 U	0.16 U	0.069 U	0.37 U	5 U	0.58	1 U	0.1 U	0.22 U	29.6
SF229	RV	3	05/05/1998		0.3	2 U	0.2 U	2 U	49	1.2	5 U	0.2 U	0.2 U	24
SF230	RV	2	11/06/1997		0.23 U	0.23	0.069 U	0.14 U	5 U	0.13 U	1 U	0.1 U	0.22 U	10.9 U
SF230	RV	3	05/05/1998		0.2 U	2 U	0.2 U	2 U			5 U	0.2 U	0.2 U	10 U
SF230	RV	3	05/05/1998						51	0.3				
SF231	RV	2	11/06/1997		0.32 U	0.23	0.069 U	0.06 U	5 U	0.026 U	1 U	0.1 U	0.22 U	10.9 U
SF275	RV	3	05/07/1998		0.032 U	0.23 U	0.16 J	0.44 U	40.5 J	2.8 J	4 J	0.16 U	0.042 U	**43.7**
SF316	RV	3	05/08/1998		0.4	2 U	0.2 U	2 U	255	3.2	28	0.2 U	0.2 U	10 U
SF317	RV	3	05/07/1998		0.032 U	0.23 U	0.042 U	0.44 U	77.9 J	0.11 U	3.2 J	0.16 U	0.042 U	
SF317	RV	3	05/07/1998											0.94 J
SF318	RV	3	05/07/1998		0.032 U	0.23 U	**15.2**	0.44 U	25.8 J	**43.9**	**107**	0.16 U	0.042 U	**2120**
SF319	RV	3	05/07/1998		0.032 U	0.23 U	**2.5 J**	0.44 U	15.1 J	**18.7**	31.6	0.16 U	0.042 U	**334**
SF320	RV	3	05/07/1998		0.032 U	0.23 U	0.042 U	0.44 U	5.6 U	0.47 J	1 J	0.16 U	0.042 U	2.6 J
SF321	RV	3	05/07/1998		0.032 U	0.23 U	0.042 U	0.44 U	5.6 U	3	0.65 J	0.16 U	0.042 U	9.8 J
SF328	SP	2	11/08/1997		1.9 J	0.45 J	0.64	0.22 J	5 UJ	7.1	3.8 U	0.1 U	0.22 UJ	**110**
SF328	SP	3	05/17/1998		1.8	2 U	**3.6**	2 U	62	11.9	6	0.2 U	0.2 U	**121**
SF338	AD	3	05/18/1998		**6.6**	1.3	0.1 U	*** 550**	20 U	0.5 U	21.2	0.2 U	0.3 U	9.4
SF339	AD	3	05/17/1998		3.1 U	8.9 J		**20.3 J**	**567**	**169**	**62.6**	0.2 U	0.3 U	**40.4**
SF342	AD	3	05/18/1998		0.94	1.5	**2.5**	3 U	48.5 U	3.1	5 U	0.32	0.3 U	**201**
SF345	AD	3	05/17/1998		0.2 U	2 U	**16.4**	**8**	20 U	**76.9**	**554**	0.2 U	0.8	**2510**
SF346	AD	3	05/17/1998		0.2 U	2 U	**5.7**	2 U	98	0.9	**453**	0.2 U	0.2 U	**851**
SF347	AD	3	05/17/1998		0.2 U	2 U	**73.2**	**3.4**	64	**666**	**1380**	0.2 U	0.2 U	*** 11000**
SF349	AD	3	05/17/1998		0.2 U	2 U	0.8	2 U	20 U	**35**	5 U	0.2 U	0.2 U	**84**
SF350	AD	3	05/18/1998		**6.2**	5.4	0.1 U	3 U	**377**	2.5	**114**	0.2 U	0.3 U	5 U

Data Summary Table
Upper South Fork - segment UpperSFCDRSeg01

Boxed Sample Results Exceed Screening Level By More Than 1X

Shaded Sample Results Exceed Screening Level By More Than 10X

Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Surface Water - Total Metals (ug/l)														
SF386	AD	2	11/19/1997		0.83 U	25.2	0.35 U	**3.2 J**	**770**	7.2	24	0.1 U	0.22 U	39.9 U
SF389	AD	2	11/19/1997		2.5 J	3.5	0.48	**5.3**	**1130**	**30.1**	**133**	0.5	0.22 U	51.3 U
SF390	AD	2	11/19/1997		0.43 U	0.5 J	0.069 U	0.44 J	43.1 J	0.17 J	1.1 J	0.1 U	0.22 U	12.1 U
SF394	AD	2	11/20/1997		1 U	1.4 J	0.069 U	0.28 U	164	2	**2090**	0.1 U	0.22 UJ	38.1 U
SF394	AD	4	05/15/1991				0.9			3				**126**
SF394	AD	5	10/04/1991				0.5			5				**83**
SF394	AD	3	05/17/1998		1.6	2 U	1.7	2 U	**400**	9.2	**2000**	0.2 U	0.2 U	**317**
SF395	AD	2	11/20/1997		0.75 U	2.6	0.069 U	**1.3 J**	**1380**	**32.2**	**678**	0.1 U	0.22 UJ	29 U
SF395	AD	3	05/18/1998		0.5 U	1.9	0.1	3 U	**910**	**16.6**	**918**	0.2 U	0.3 U	17.7
SF396	AD	2	11/20/1997		0.32 U	0.16 U	0.069 U	0.28 U	5.9 U	0.62	1 U	0.1 U	0.22 UJ	11.7 U
SF396	AD	3	05/19/1998		0.26 U	0.23 U	0.041 U	0.44 U	40.6 J	0.84 J	0.8 J	0.16 U	0.042 U	1.1 J
SF398	RV	3	05/13/1998		0.28 J	0.33 J	0.4 J	0.83 J	84.9 J	5.2	19	0.16 U	0.042 U	**84.3**
SF605	OF	8	04/02/1996				**16.2**	5 U		**54**	**314**	0.2 U	1 U	**2520**
SF606	OF	8	03/23/1998		45 U	40 U	2 U	**23.7**		25 UJ	9.74	0.2 U	4 U	17 J
SF607	OF	8	04/02/1996				**3.06**	5 U		**65.4**	**102**	0.2 U	1 U	**574**
SF607	OF	8	03/24/1998		45 U	40 U	2 U	3 U		**130 J**	**288**	0.2 U	4 U	**73.5**
SF607	OF	8	07/31/1990				0.5 U			**153**				**83**
SF607	OF	8	11/07/1991				1 U			**922**				**450**
SF607	OF	8	01/03/1996				2			**54**				**496**
SF607	OF	8	01/10/1996				**3**			**79**				**431**
SF607	OF	8	01/17/1996				**4**			**76**				**557**
SF607	OF	8	01/24/1996							**130**				**557**
SF607	OF	8	01/31/1996				**7**			**159**				**592**
SF607	OF	8	02/07/1996				**5**			**119**				**993**
SF607	OF	8	02/14/1996				**4**			**159**				**513**
SF607	OF	8	02/21/1996				2			**109**				**441**
SF607	OF	8	02/28/1996				2			**132**				**470**
SF607	OF	8	03/06/1996				2			**119**				**501**
SF607	OF	8	03/13/1996				**3**			**104**				**581**
SF607	OF	8	03/20/1996				**3**			**94**				**697**
SF607	OF	8	03/27/1996							**103**				**671**
SF609	OF	8	04/02/1996				1 U	5 U		**109**	**280**	0.2 U	1 U	**245**
SF609	OF	8	03/24/1998		45 U	40 U	2 U	3 U		**81 J**	**501**	0.2 U	4 U	**310**
SF609	OF	8	07/31/1990				0.7			**32**				30
SF609	OF	8	11/07/1991				1 U			**21**				**70**
SF609	OF	8	12/21/1994				**5**			**59**				**403**
SF609	OF	8	12/28/1994				**7**			**90**				**477**

Data Summary Table
Upper South Fork - segment UpperSFCDRSeg01

Boxed Sample Results Exceed Screening Level By More Than 1X

Shaded Sample Results Exceed Screening Level By More Than 10X

Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Surface Water - Total Metals (ug/l)														
SF609	OF	8	01/04/1995				**5**			**89**				**497**
SF609	OF	8	01/11/1995				**5**			**122**				**531**
SF609	OF	8	01/18/1995				**4**			**134**				**604**
SF609	OF	8	01/25/1995				**3**			**121**				**585**
SF609	OF	8	01/03/1996							**100**				**303**
SF609	OF	8	01/10/1996							**136**				**127**
SF609	OF	8	01/17/1996							**113**				**268**
SF609	OF	8	01/24/1996							**135**				**179**
SF609	OF	8	01/31/1996							**155**				**202**
SF609	OF	8	02/07/1996				**3**			**148**				**1910**
SF609	OF	8	02/14/1996				2			**163**				**356**
SF609	OF	8	02/21/1996				2			**155**				**198**
SF609	OF	8	02/28/1996							**161**				**137**
SF609	OF	8	03/06/1996				2			**183**				**150**
SF609	OF	8	03/13/1996							**162**				**199**
SF609	OF	8	03/20/1996							**203**				**264**
SF609	OF	8	03/27/1996							**137**				**252**
SF611	OF	8	04/02/1996				1 U	5 U		3.27	**2660**	0.2 U	1 U	**61.8**
SF611	OF	8	03/24/1998		45 U	40 U	2 U	3 U		25 U	**1470**	0.2 U	4 U	14
SF611	OF	8	01/31/1994				**7**			**70**				**142**
SF611	OF	8	02/28/1994				**7**			**73**				**99**
SF611	OF	8	03/31/1994				**6**			**68**				**132**
SF611	OF	8	04/30/1994				**7**			**83**				**169**
SF611	OF	8	05/31/1994				**8**			**82**				**168**
SF611	OF	8	06/30/1994				**7**			**129**				**130**
SF611	OF	8	07/31/1994				**7**			**87**				**197**
SF611	OF	8	08/31/1994				**8**			**87**				**85**
SF611	OF	8	09/30/1994				**7**			**71**				**114**
SF611	OF	8	10/31/1994				**6**			**99**				**316**
SF611	OF	8	11/30/1994				**8**			**131**				**178**
SF611	OF	8	12/31/1994				**8**			**86**				**234**
SF611	OF	8	01/31/1995				**3**			**74**				**279**
SF611	OF	8	02/28/1995				**3**			**69**				**181**
SF611	OF	8	03/31/1995				**4**			**71**				**141**
SF611	OF	8	04/30/1995				**3**			**75**				**178**
SF611	OF	8	05/31/1995				**3**			**79**				**153**
SF611	OF	8	06/30/1995				**3**			**90**				**137**

Data Summary Table
Upper South Fork - segment UpperSFCDRSeg01

Boxed Sample Results Exceed Screening Level By More Than 1X

Shaded Sample Results Exceed Screening Level By More Than 10X

Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Surface Water - Total Metals (ug/l)														
SF611	OF	8	07/31/1995				2 U			100				152
SF611	OF	8	08/31/1995				2			93				135
SF611	OF	8	09/30/1995				2 U			104				583
SF611	OF	8	10/31/1995				5			306				512
SF611	OF	8	11/30/1995				5			110				507
SF611	OF	8	12/31/1995				6			135				234
SF611	OF	8	01/31/1996				8			80				340
SF611	OF	8	02/29/1996				4			82				188
SF611	OF	8	03/31/1996				2			89				767
SF611	OF	8	04/30/1996				8			128				231
SF611	OF	8	05/31/1996				3			100				244
SF611	OF	8	06/30/1996				3			114				247
SF611	OF	8	07/31/1996				2			100				198
SF611	OF	8	08/31/1996				2 U			83				124
SF611	OF	8	09/30/1996				2 U			180				264
SF611	OF	8	11/30/1996				3			100				95
SF611	OF	8	12/31/1996				4			70				439
SF611	OF	8	01/31/1997				6			80				533
SF611	OF	8	02/28/1997				2 U			110				183
SF611	OF	8	03/31/1997				3			60				445
SF611	OF	8	04/30/1997				3			50				195
SF611	OF	8	05/31/1997				2 U			80				225
SF611	OF	8	06/30/1997				3			90				247
SF611	OF	8	07/31/1997				2 U			90				172
SF611	OF	8	08/31/1997				2 U			100				321
SF611	OF	8	09/30/1997				2 U			80				265
SF611	OF	8	10/31/1997				2 U			130				182
SF611	OF	8	11/30/1997				2 U			67				185
SF611	OF	8	12/31/1997				2 U			62				182
SF611	OF	8	01/31/1998				2 U			65				
SF611	OF	8	02/28/1998				2 U			60				134
SF611	OF	8	04/30/1998				2 U			80				162
SF611	OF	8	05/31/1998				2 U			80				299
SF611	OF	8	06/30/1998				2 U			70				183
SF611	OF	8	01/15/1994				6			63				101
SF611	OF	8	02/15/1994				6			64				95
SF611	OF	8	03/15/1994				5			59				120

Data Summary Table
Upper South Fork - segment UpperSFCDRSeg01

Boxed Sample Results Exceed Screening Level By More Than 1X

Shaded Sample Results Exceed Screening Level By More Than 10X

Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Surface Water - Total Metals (ug/l)														
SF611	OF	8	04/15/1994				7			67				144
SF611	OF	8	05/15/1994				6			70				160
SF611	OF	8	06/15/1994				6			82				
SF611	OF	8	07/15/1994				7			75				118
SF611	OF	8	08/15/1994				7			76				152
SF611	OF	8	09/15/1994				6			57				82
SF611	OF	8	10/15/1994				6			85				100
SF611	OF	8	11/15/1994				5			88				174
SF611	OF	8	12/15/1994				7			77				148
SF611	OF	8	01/15/1995				2			66				157
SF611	OF	8	02/15/1995				1			57				183
SF611	OF	8	03/15/1995				2			62				156
SF611	OF	8	04/15/1995				1			69				126
SF611	OF	8	05/15/1995				1			70				150
SF611	OF	8	06/15/1995				1			80				129
SF611	OF	8	07/15/1995				2 U			88				132
SF611	OF	8	08/15/1995				0.4			82				112
SF611	OF	8	09/15/1995				2 U			81				116
SF611	OF	8	10/15/1995				1			134				263
SF611	OF	8	11/15/1995				2							222
SF611	OF	8	12/15/1995				3			7.8				280
SF611	OF	8	01/15/1996				3			92				182
SF611	OF	8	02/15/1996				2			66				229
SF611	OF	8	03/15/1996				1			74				172
SF611	OF	8	04/15/1996				2			82				283
SF611	OF	8	05/15/1996				1			89				177
SF611	OF	8	06/15/1996				1			93				207
SF611	OF	8	07/15/1996				2 U			90				195
SF611	OF	8	08/15/1996				2 U			77				151
SF611	OF	8	09/15/1996				2 U			73				110
SF611	OF	8	10/15/1996							90				133
SF611	OF	8	11/15/1996				2 U			90				66
SF611	OF	8	12/15/1996				2 U			70				193
SF611	OF	8	01/15/1997				3			60				222
SF611	OF	8	02/15/1997				2 U			70				155
SF611	OF	8	03/15/1997				2 U			50				260
SF611	OF	8	04/15/1997				2 U			40				172

Data Summary Table
Upper South Fork - segment UpperSFCDRSeg01

Boxed Sample Results Exceed Screening Level By More Than 1X

Shaded Sample Results Exceed Screening Level By More Than 10X

Shaded Results With (*) Exceed Screening Level By More Than 100X

Surface Water - Total Metals (ug/l)

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
SF611	OF	8	05/15/1997				2 U			**70**				**177**
SF611	OF	8	06/15/1997				2 U			**70**				**211**
SF611	OF	8	07/15/1997				2 U			**70**				**157**
SF611	OF	8	08/15/1997				2 U			**80**				**235**
SF611	OF	8	09/15/1997				2 U			**70**				**219**
SF611	OF	8	10/15/1997				2 U			**80**				**116**
SF611	OF	8	11/15/1997				2 U			**56**				**124**
SF611	OF	8	12/15/1997				2 U			**51**				**97**
SF611	OF	8	01/15/1998				2 U			**57**				
SF611	OF	8	02/15/1998				2 U			**50**				**110**
SF611	OF	8	04/15/1998				2 U			**60**				**117**
SF611	OF	8	05/15/1998				2 U			**70**				**209**
SF611	OF	8	06/15/1998				2 U			**60**				**150**
SF612	OF	8	04/02/1996				1 U	5 U		**15.5**	9.9	0.2 U	1 U	**110**
SF612	OF	8	03/24/1998		45 U	40 U	2 U	3 U		25 U	5.63	0.2 U	4 U	**93.7**
SF619	OF	8	03/23/1998		45 U	40 U	2 U	3 U		25 UJ	**79.2**	0.2 U	4 U	23.6 J
SF627	OF	8	04/04/1996		5 U	5 U	5 U	5 U		5.6	**140**	0.2 U	1 U	**434**
SF627	OF	8	03/25/1998		45 U	40 U	2 U	3 U		25 UJ	33.2	0.2 U	4 U	**278**
SF650	RV	18	05/24/1999						**1400**	**83**	**340**			**80**
SF8106	RV	13	---				**5**	35 U	12 U		2 U			3 U
SF8128	WL	13	---			29 U	3 U	***310**	12 U	15 U	14	5 U		3 U
SF8129	AD	13	---			29 U	**4**	35 U	12 U	3.9	2 U	5 U		3 U
SF8130	AD	13	---			29 U	3 U	35 U	12 U	4	2 U	5 U		3 U
SF8131	AD	13	---			29 U	**5**	35 U	12 U	15 U	4	5 U		3 U
SF8132	AD	13	---			6.2	**4**	35 U	12 U	15 U	4	5 U		3 U
SF8133	AD	13	---			29 U	**6**	**44**	12 U	15 U	7	5 U		3 U
SF8134	WL	13	---			29 U	**8**	35 U	12 U	15 U	7	5 U		3 U
SF8221	AD	13	---			41	**5**	35 U	12 U	15 U	3	5 U		3 U
SF8222	AD	13	---			29 U	**8**	35 U	220	15 U	**340**	5 U		3 U
SF8223	RV	13	---			29 U	**7**	35 U	12 U	15 U	6	5 U		3 U
SF8224	AD	13	---			29 U	**8**	35 U	12 U	15 U	7	5 U		3
SF8252	AD	13	---			29 U	3 U	35 U	12 U	15 U	5	5 U		10

Surface Water - Dissolved Metals (ug/l)

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
SF10	RV	5	10/03/1991				**8**			1				13
SF201	RV	2	11/11/1997		0.67	1.2	0.093	0.5 U	10 U	0.13	1.4	0.2 U	0.03 U	20.9
SF201	RV	3	05/09/1998		0.71	1 U	**0.6**	3 U	20 U	0.92	5 U	0.2 UJ	0.3 U	**117**

Data Summary Table
Upper South Fork - segment UpperSFCDRSeg01

Boxed Sample Results Exceed Screening Level By More Than 1X

Shaded Sample Results Exceed Screening Level By More Than 10X

Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Surface Water - Dissolved Metals (ug/l)														
SF202	RV	2	11/11/1997		0.5 U		0.04 U	0.5 U	10 U	0.11	1 U	0.2 U	0.03 U	4.5
SF202	RV	2	11/11/1997			0.24								
SF202	RV	18	05/22/1999				1 UJ		10 U	1 U	1 U			1.3
SF202	RV	3	05/09/1998		0.5 U	1 U	0.1 U	3 U	20 U	0.5 U	5 U	0.2 UJ	0.3 U	6.2
SF204	RV	2	11/10/1997		0.5 U	0.11	0.04 U	0.5 U	10 U	0.1 U	1 U	0.2 U	0.03 U	5.99
SF204	RV	3	05/09/1998		0.5 U	1 U	0.1 U	**4.3**	20 U	0.5 U	5 U	0.2 UJ	0.3 U	5.9
SF205	RV	2	11/10/1997		0.5 U	0.32	0.04 U	0.5 U	36.5	0.1 U	11.3	0.2 U	0.03 U	6.78
SF205	RV	4	05/16/1991				0.2 U			3 UJ				20 U
SF205	RV	5	10/04/1991				0.2 U			1 U				12 U
SF205	RV	7	10/26/1993				0.25 U			**2.5 J**				26.2
SF205	RV	7	11/30/1993				0.25 U			**3 J**				5.7 J
SF205	RV	7	12/16/1993				0.25 U			1.5 U				**59.3**
SF205	RV	7	01/19/1994				0.5 U			1.5 U				14.8
SF205	RV	7	02/15/1994				0.5 U			1.5 U				11
SF205	RV	7	03/07/1994				0.25 U			1.5 U				**59**
SF205	RV	7	03/23/1994				0.25 U			1.5 U				15
SF205	RV	7	04/06/1994				0.25 U			**3 J**				5 U
SF205	RV	7	04/18/1994				0.25 U			**5**				5 U
SF205	RV	7	05/03/1994				0.25 U			**3 J**				15
SF205	RV	7	05/20/1994				0.25 U			**2.5 J**				20
SF205	RV	7	06/08/1994				0.25 U			1.5 U				19
SF205	RV	7	06/24/1994				0.25 U			1.5 U				23
SF205	RV	7	07/23/1994				0.25 U			**4**				**43**
SF205	RV	7	08/16/1994				0.25 U			**2.5 J**				22
SF205	RV	7	09/09/1994				0.25 U			1.5 U				11
SF205	RV	7	10/05/1994				0.25 U			1.5 U				21
SF205	RV	7	11/15/1994				0.25 U			1.5 U				13
SF205	RV	7	12/14/1994				0.25 U			1.5 U				5 U
SF205	RV	7	01/11/1995				0.25 U			1.5 U				23
SF205	RV	7	02/10/1995				0.25 U			1.5 U				21
SF205	RV	7	03/08/1995				0.25 U			1.5 U				25
SF205	RV	7	03/22/1995				0.25 U			1.5 U				22
SF205	RV	7	04/12/1995				0.25 U			1.5 U				14
SF205	RV	7	04/25/1995				0.25 U			1.5 U				10 J
SF205	RV	7	05/09/1995				0.3 J			1.5 U				12
SF205	RV	7	05/23/1995				0.25 U			1.5 U				5 U
SF205	RV	7	06/13/1995				**0.5 J**			**4**				10 J

Data Summary Table
Upper South Fork - segment UpperSFCDRSeg01

Boxed Sample Results Exceed Screening Level By More Than 1X

Shaded Sample Results Exceed Screening Level By More Than 10X

Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Surface Water - Dissolved Metals (ug/l)														
SF205	RV	7	06/28/1995				0.25 U			1.5 U				5 U
SF205	RV	7	07/12/1995				0.25 U			1.5 U				16
SF205	RV	7	07/26/1995				0.25 U			1.5 U				5 U
SF205	RV	7	08/15/1995				0.25 U			1.5 U				20
SF205	RV	7	09/14/1995				0.25 U			1.5 U				12
SF205	RV	18	05/22/1999				1 UJ			1				2.7
SF205	RV	18	05/25/1999				**1**		11	1 U	5.4			5
SF205	RV	3	05/11/1998		0.2 U	2 U	0.2 U	2 U	20 U	0.2 U	5 U	0.2 U	0.2 U	10 U
SF206	RV	2	11/10/1997		2.6	0.64	0.04 U	**5.49**	10 U	0.1 U	1 U	0.2 U	0.03 U	4.3
SF206	RV	3	05/08/1998		**4**	2 U	0.2 U	**7**	20 U	0.2 U	5 U	0.2 U	0.2 U	10 U
SF207	RV	2	11/10/1997		1.2	0.38	0.04 U	0.54	10 U	0.1 U	1 U	0.2 U	0.03 U	16.4
SF207	RV	3	05/08/1998		0.9	2 U	0.2 U	2 U	20 U	0.2 U	5 U	0.2 U	0.2 U	10 U
SF208	RV	2	11/10/1997		0.95	0.46	0.04 U	0.75	67.2	0.71	**124**	0.2 U	0.03 U	10
SF208	RV	4	05/16/1991				0.2 U			3 U				20 U
SF208	RV	5	10/04/1991				0.2 U			1 U				12 U
SF208	RV	18	10/22/1998				1 UJ			1 UJ				20 UJ
SF208	RV	18	10/22/1998				1 UJ			1 UJ				20 UJ
SF208	RV	18	11/16/1998				1 UJ			**2**				**59**
SF208	RV	18	12/14/1998				1 UJ			1				24
SF208	RV	18	01/20/1999				1 UJ			**1.2**				22
SF208	RV	18	03/22/1999				1 UJ			1				20
SF208	RV	18	04/19/1999				1 UJ			1				9.1
SF208	RV	18	05/05/1999				1 UJ		18	1 U	**48**			8.2
SF208	RV	18	05/22/1999				1 UJ		12	1 U	**28**			4.3
SF208	RV	18	05/25/1999				1 U		12	1 U	12			3.5
SF208	RV	18	05/27/1999				1 UJ		7.7	1 U	18			4.1
SF208	RV	18	05/31/1999				1 UJ		8.4	1 U	16			3.9
SF208	RV	18	06/16/1999				1 UJ			1				3.7
SF208	RV	18	07/12/1999				1 U			1 U				3
SF208	RV	18	08/12/1999				1 U			1 U				3
SF208	RV	18	08/31/1999				1 U			1 U				8
SF208	RV	3	05/09/1998		0.5 U	1 U	0.1 U	3 U	20 U	0.5 U	17.7	0.2 UJ	0.3 U	6
SF209	RV	2	11/10/1997		2.9	1	0.04 U	0.94	10 U	0.91	1 U	0.2 U	0.03 U	2.7
SF209	RV	3	05/08/1998		1	2 U	0.2 U	2 U	20 U	0.6	5 U	0.2 U	0.2 U	10 U
SF209	RV	3	05/19/1998		0.47 U	0.27 J	0.041 U	0.44 U	56.5 J	0.11 U	**34.2 J**	0.16 U	0.042 UJ	4 J
SF210	RV	2	11/10/1997		0.5 U	0.13	0.04 U	0.54	10 U	0.1 U	1 U	0.2 U	0.03 U	4.2
SF210	RV	3	05/08/1998		0.2 U	2 U	0.2 U	2 U	20 U	0.2 U	5 U	0.2 U	0.2 U	10 U

Data Summary Table
Upper South Fork - segment UpperSFCDRSeg01

Boxed Sample Results Exceed Screening Level By More Than 1X

Shaded Sample Results Exceed Screening Level By More Than 10X

Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Surface Water - Dissolved Metals (ug/l)														
SF211	RV	2	11/09/1997		0.5 U	0.74	0.29	0.5 U	10 U		1.8	0.2 U	0.03 U	
SF211	RV	2	11/09/1997							0.3				22.9
SF211	RV	3	05/08/1998		0.2 U	2 U	0.2 U	2 U	20 U	0.2 U	5 U	0.2 U	0.2 U	10 U
SF212	RV	2	11/09/1997		**5.24**	2.7	0.04 U	**12.1**	10 U	**1.62**	1.9	0.2 U	0.03 U	6.84
SF212	RV	3	05/08/1998		2.6	2 U	0.2 U	**7**	20 U	0.6	5 U	0.2 U	0.2 U	10 U
SF213	RV	2	11/10/1997		0.5 U	0.1 U	0.04 U	0.5 U	10 U	0.1 U	1 U	0.2 U	0.03 U	7.35
SF213	RV	3	05/08/1998		0.2 U	2 U	0.2 U	2 U	20 U	0.2 U	5 U	0.2 U	0.2 U	10 U
SF214	RV	2	11/09/1997		0.5 U	0.17	0.04 U	0.5 U	10 U	0.11	1.5	0.2 U	0.03 U	5.93
SF214	RV	3	05/11/1998		0.2 U	2 U	0.2 U	2 U	20 U	0.2 U	5 U	0.2 U	0.2 U	10 U
SF215	RV	2	11/09/1997		0.99	0.49	0.04 U	1.4	33.1	0.69	**60.8**	0.2 U	0.03 U	11.4
SF215	RV	4	05/15/1991				0.2 U			3 UJ				20 U
SF215	RV	5	10/04/1991				0.2 U			1 U				12 U
SF215	RV	3	05/10/1998		0.032 U	0.35 J	0.042 U	0.61 J	34.6 J	0.32 J	10.9 J	0.16 U	0.042 U	7.6 J
SF216	RV	2	11/09/1997		0.53	0.18	0.12	0.62	10 U	0.27	1 U	0.2 U	0.03 U	28.4
SF218	RV	2	11/09/1997		0.92	1.1	**0.96**	0.5 U	10 U	**3.39**	16.3	0.2 U	0.03 U	**190**
SF218	RV	3	05/08/1998		0.9	2 U	**0.9**	2 U	20 U	**1.7**	5 U	0.2 U	0.2 U	**150**
SF219	RV	2	11/08/1997		0.5 U	0.21	0.04 U	0.5 U	10 U	0.1 U	1 U	0.2 U	0.03 U	2
SF219	RV	3	05/06/1998		0.5 U	1 U	0.1 U	3 U	20 U	0.5 U	5 U	0.2 U	0.3 U	5 U
SF220	RV	2	11/08/1997		1.9	0.5	**0.59**	1.1	31.1	**3.08**	**76.3**	0.2 U	0.03 U	**135**
SF220	RV	4	05/15/1991				0.2			3 U				27
SF220	RV	5	10/04/1991				**0.6**			**4**				**106**
SF220	RV	7	10/26/1993				**0.8**			**3 J**				**177**
SF220	RV	7	11/30/1993				**0.8**			**5**				**166**
SF220	RV	7	12/20/1993				**0.8**			**3 J**				**194**
SF220	RV	7	01/19/1994				**0.6**			**3 J**				**177**
SF220	RV	7	02/15/1994				**0.7**			**4**				**183**
SF220	RV	7	03/07/1994				**0.6**			**5**				**116**
SF220	RV	7	03/23/1994				**0.6**			**4**				**138**
SF220	RV	7	04/06/1994				0.25 U			1.5 U				**73**
SF220	RV	7	04/18/1994				0.25 U			1.5 U				26
SF220	RV	7	05/03/1994				0.25 U			1.5 U				**58**
SF220	RV	7	05/20/1994				**0.8**			**7**				**47**
SF220	RV	7	06/08/1994				**0.5 J**			1.5 U				**65**
SF220	RV	7	06/24/1994				**0.5 J**			**3 J**				**89**
SF220	RV	7	07/23/1994				**0.5 J**			**4**				**135**
SF220	RV	7	08/16/1994				**0.8**			**5**				**176**
SF220	RV	7	09/09/1994				**0.6**			1.5 U				**150**

Data Summary Table
Upper South Fork - segment UpperSFCDRSeg01

Boxed Sample Results Exceed Screening Level By More Than 1X

Shaded Sample Results Exceed Screening Level By More Than 10X

Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Surface Water - Dissolved Metals (ug/l)														
SF220	RV	7	10/05/1994				1			3 J				198
SF220	RV	7	11/15/1994				0.8			1.5 U				183
SF220	RV	7	12/14/1994				1.1			3 J				216
SF220	RV	7	01/11/1995				0.6			3 J				121
SF220	RV	7	02/10/1995				0.5 J			1.5 U				108
SF220	RV	7	03/08/1995				0.6			1.5 U				115
SF220	RV	7	03/22/1995				0.9			1.5 U				191
SF220	RV	7	04/12/1995				1.2			6				106
SF220	RV	7	04/25/1995				0.6			1.5 U				77
SF220	RV	7	05/08/1995				0.5 J			3 J				45
SF220	RV	7	05/23/1995				0.9			4				54
SF220	RV	7	06/13/1995				0.6			4				51
SF220	RV	7	06/28/1995				0.25 U			3 J				68
SF220	RV	7	07/12/1995				0.5 J			4				97
SF220	RV	7	07/26/1995				0.6			3 J				117
SF220	RV	7	08/15/1995				0.6			5				131
SF220	RV	7	09/14/1995				0.8			4				161
SF220	RV	3	05/10/1998		0.21 J	0.42 J	0.19 J	0.61 J	39.6 J	0.62 J	13.8 J	0.16 U	0.042 U	42.2
SF221	RV	2	11/08/1997				0.046							
SF221	RV	3	05/06/1998		0.5 U	1 U	0.1 U	3 U	20 U	0.5 U	5 U	0.2 U	0.3 U	5 U
SF222	RV	2	11/08/1997		0.5 U	0.12	0.04 U	0.5 U	10 U	0.1 U	1 U	0.2 U	0.03 U	3.2
SF222	RV	3	05/06/1998		0.5 U	1 U	0.1 U	3 U	20 U	0.5 U	5 U	0.2 U	0.3 U	5 U
SF223	RV	2	11/08/1997		0.5 U	0.49	8.37	0.5 U	10 U	9.23	2.2	0.2 U	0.03 U	1340
SF223	RV	7	04/24/1998				5			14				628
SF223	RV	7	05/28/1998				3.9			16				613
SF223	RV	7	06/25/1998				5			18				789
SF223	RV	7	07/27/1998				6.5			18				609
SF223	RV	7	08/25/1998				7.5			17				943
SF223	RV	7	09/23/1998				8.1			19				1050
SF223	RV	7	10/27/1998				10			15				1540
SF223	RV	7	11/24/1998				16			16				2400
SF223	RV	7	12/31/1998				12			13				1660
SF223	RV	7	01/14/1999				10			9				1480
SF223	RV	7	02/22/1999				9.4			9				1330
SF223	RV	7	03/09/1999				17			13				1420
SF223	RV	3	05/06/1998		0.5 U	1 U	8.2	3 U	20 U	6.4	5 U	0.2 U	0.3 U	1400
SF224	RV	2	11/08/1997		0.95	0.52	0.049	0.91	10 U	9.96	1 U	0.2 U	0.03 U	5.57

Data Summary Table
Upper South Fork - segment UpperSFCDRSeg01

Boxed Sample Results Exceed Screening Level By More Than 1X

Shaded Sample Results Exceed Screening Level By More Than 10X

Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Surface Water - Dissolved Metals (ug/l)														
SF224	RV	3	05/06/1998		0.5 U	1 U	0.1 U	3 U	31.6 U	**4.7**	5 U	0.2 U	0.3 U	5 U
SF225	RV	2	11/07/1997		0.5 U	0.25	0.04 U	0.5 U	10 U	0.1 U	1 U	0.2 U	0.03 U	5
SF225	RV	3	05/05/1998		0.2 U	2 U	0.2 U	2 U	20 U	0.2 U	5 U	0.2 U	0.2 U	10 U
SF226	RV	2	11/07/1997		0.5 U	0.16	0.04 U	0.5 U	10 U	0.22	1 U	0.2 U	0.03 U	11.5
SF226	RV	3	05/05/1998		0.2 U	2 U	0.2 U	2 U	20 U	0.2 U	5 U	0.2 U	0.2 U	10 U
SF227	RV	2	11/07/1997		1.6	0.45	**0.79**	0.93	22	**4.03**	**45**	0.2 U	0.03 U	**164**
SF227	RV	4	05/15/1991				0.3			3 U				41
SF227	RV	5	10/04/1991				**0.8**			1				**77**
SF227	RV	18	05/24/1999				1 U		5.9	1 U	7.3			**45**
SF227	RV	3	05/10/1998		0.17 J	0.37 J	0.34 J	0.59 J	38.2 J	0.65 J	9.7 J	0.16 U	0.042 U	**64.3**
SF228	RV	2	11/07/1997		1.7	0.44	**0.87**	0.95	19	**2.42**	**44.9**	0.2 U	0.03 U	**193**
SF228	RV	4	05/16/1991				0.3			3 UJ				**54**
SF228	RV	5	10/04/1991				**0.6**			1				10
SF228	RV	7	10/26/1993				**1.1**			**3 J**				**225**
SF228	RV	7	11/30/1993				**1**			1.5 U				**239**
SF228	RV	7	12/20/1993				**1.5**			1 U				**241**
SF228	RV	7	01/19/1994				**0.9**			1.5 U				**190**
SF228	RV	7	02/15/1994				**0.9**			1.5 U				**212**
SF228	RV	7	03/07/1994				**0.8**			1.5 U				**182**
SF228	RV	7	03/23/1994				**1**			**3 J**				**216**
SF228	RV	7	04/06/1994				**0.8**			1.5 U				**145**
SF228	RV	7	04/18/1994				**0.5 J**			1.5 U				**86**
SF228	RV	7	05/03/1994				**0.6**			1.5 U				**89**
SF228	RV	7	05/20/1994				**0.8**			**2.5 J**				**95**
SF228	RV	7	06/08/1994				**0.8**			1.5 U				**132**
SF228	RV	7	06/24/1994				**0.8**			1.5 U				**122**
SF228	RV	7	07/23/1994				**0.9**			1.5 U				**148**
SF228	RV	7	08/16/1994				**1.3**			**2.5 J**				**221**
SF228	RV	7	09/09/1994				**0.9**			1.5 U				**183**
SF228	RV	7	11/15/1994				**1.1**			**3 J**				**277**
SF228	RV	7	12/14/1994				**1.7**			**4**				**339**
SF228	RV	7	01/11/1995				**1**			1.5 U				**209**
SF228	RV	7	02/10/1995				**0.9**			1.5 U				**213**
SF228	RV	7	03/22/1995				**1**			1.5 U				**182**
SF228	RV	7	04/12/1995				**1.7**			**5**				**170**
SF228	RV	7	04/25/1995				**0.8**			1.5 U				**140**
SF228	RV	7	05/08/1995				**1.4**			**3 J**				**76**

Data Summary Table
Upper South Fork - segment UpperSFCDRSeg01

Boxed Sample Results Exceed Screening Level By More Than 1X

Shaded Sample Results Exceed Screening Level By More Than 10X

Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Surface Water - Dissolved Metals (ug/l)														
SF228	RV	7	05/23/1995				1.4			3 J				89
SF228	RV	7	06/13/1995				0.9			5				102
SF228	RV	7	06/28/1995				0.8			1.5 U				116
SF228	RV	7	07/12/1995				0.9			3 J				126
SF228	RV	7	07/26/1995				1			1.5 U				181
SF228	RV	7	08/15/1995				1.1			1.5 U				203
SF228	RV	7	09/14/1995				1.1			1.5 U				208
SF228	RV	7	10/18/1995				0.8			2.5 J				260
SF228	RV	7	11/22/1995				1.1			1.5 U				1.5 U
SF228	RV	7	12/27/1995				1.6			4				249
SF228	RV	7	01/17/1996				1.1			3 J				227
SF228	RV	7	02/29/1996				0.9			4				188
SF228	RV	7	03/27/1996				0.9			3 J				193
SF228	RV	7	04/17/1996				0.7			3 J				146
SF228	RV	7	05/08/1996				0.8			4				151
SF228	RV	7	06/19/1996				0.9			4				145
SF228	RV	7	07/23/1996				1.2			5				140
SF228	RV	7	08/21/1996				1			6				246
SF228	RV	7	09/26/1996				1.2			5				236
SF228	RV	7	10/29/1996				1.1			4				215
SF228	RV	7	11/26/1996				1.2			7				280
SF228	RV	7	12/17/1996				1.5			5				475
SF228	RV	7	01/29/1997				1.1			3				334
SF228	RV	7	03/27/1997				1.4							253
SF228	RV	7	04/17/1997				1.8			1.5				209
SF228	RV	7	06/25/1997				0.5			2.5				109
SF228	RV	7	07/24/1997				0.8			1.5				140
SF228	RV	7	08/13/1997				0.9			4				159
SF228	RV	7	09/04/1997				1.3			7				223
SF228	RV	7	10/17/1997				1.3			6				243
SF228	RV	7	11/25/1997				1			3				200
SF228	RV	7	12/18/1997				1.3			8				206
SF228	RV	7	01/22/1998				1.3			4				235
SF228	RV	7	02/26/1998				1.3			4				257
SF228	RV	7	03/19/1998				1			3				204
SF228	RV	7	04/24/1998				1.2			3				114
SF228	RV	7	04/24/1998				1.2			3				94

Data Summary Table
Upper South Fork - segment UpperSFCDRSeg01

Boxed Sample Results Exceed Screening Level By More Than 1X

Shaded Sample Results Exceed Screening Level By More Than 10X

Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Surface Water - Dissolved Metals (ug/l)														
SF228	RV	7	05/28/1998				0.6			3				116
SF228	RV	7	06/25/1998				1			3 U				163
SF228	RV	7	07/27/1998				0.9			3				130
SF228	RV	7	08/25/1998				1			3				161
SF228	RV	7	09/23/1998				1.1			4				183
SF228	RV	7	10/27/1998				1.2			4				294
SF228	RV	7	11/24/1998				2.4			3				282
SF228	RV	7	12/31/1998				2.6			7				284
SF228	RV	7	02/22/1999				2.8			3 U				194
SF228	RV	7	03/09/1999				3.1			4				235
SF228	RV	3	05/10/1998		0.18 J			0.68 J	40 J			0.16 U	0.042 U	
SF228	RV	3	05/10/1998			0.38 J	0.35 J			7.3 J	10 J			74.3
SF229	RV	2	11/07/1997		0.5 U	0.36	0.092	0.5 U	10 U	0.24	1 U	0.2 U	0.03 U	23.7
SF229	RV	3	05/05/1998		0.2	2 U	0.2 U	2 U	20 U	0.2 U	5 U	0.2 U	0.2 U	22
SF230	RV	2	11/06/1997		0.5 U	0.36	0.04 U	0.5 U	10 U	0.1 U	1 U	0.2 U	0.03 U	3.8
SF230	RV	3	05/05/1998		0.2 U	2 U	0.2 U	2 U	20 U	0.2 U	5 U	0.2 U	0.2 U	10 U
SF231	RV	2	11/06/1997		0.5 U	0.43	0.04 U	0.5 U	10 U	0.1 U	1 U	0.2 U	0.03 U	6.04
SF275	RV	3	05/07/1998		0.032 U	0.23 U	0.17 J	0.44 U	26.8 J	0.23 J	0.4 J	0.16 U	0.042 U	49.4
SF316	RV	3	05/08/1998		0.3	2 U	0.2 U	2 U	20 U	0.2 U	5 U	0.2 U	0.2 U	10 U
SF317	RV	3	05/07/1998		0.032 U	0.23 U	0.042 U	0.44 U	57.3 J		0.5 J	0.16 U	0.042 U	
SF317	RV	3	05/07/1998							0.17 J				1.7 J
SF318	RV	3	05/07/1998		0.032 U	0.23 U	16	0.44 U	15.9 J	35.1	107	0.16 U	0.042 U	2340
SF319	RV	3	05/07/1998		0.032 U	0.23 U	2.6 J	0.44 U	5.6 U	8.7	26.5	0.16 U	0.042 U	378
SF320	RV	3	05/07/1998		0.032 U	0.23 U	0.042 U	0.44 U	5.6 U	0.11 U	0.42 J	0.16 U	0.042 U	3.1 J
SF321	RV	3	05/07/1998		0.032 U	0.23 U	0.042 U	0.44 U	5.6 U	1.2 J	0.07 J	0.16 U	0.042 U	10 J
SF328	SP	2	11/08/1997		1.8	0.72	0.67	0.5 U	10 U	7.42	1.5	0.2 U	0.03 U	88.6
SF328	SP	3	05/17/1998		1.7	2 U	1.1	2 U	41	7.7	5 U	0.2 U	0.2 U	115
SF338	AD	3	05/18/1998		6.7	1 U	0.1 U	* 551	20 U	0.5 U	20.9	0.2 U	0.3 U	9.9
SF339	AD	3	05/17/1998		1 U	7.5 J		0.6 J	69.8 J	2.4 J	1.9 UJ	0.2 UJ		10 J
SF342	AD	3	05/18/1998		0.99	1.4	2.4	3 U	20 U	1.1	5 U	0.2 U	0.3 U	190
SF345	AD	3	05/17/1998		0.2 U	2 U	15.1	7.9	20 U	68.7	563	0.2 U	0.7	2550
SF346	AD	3	05/17/1998		0.2 U	2 U	5	2 U	25	0.2	256	0.2 U	0.2 U	808
SF347	AD	3	05/17/1998		0.2 U	2 U	* 72.3	3	24	* 589	1400	0.2 U	0.2 U	* 11200
SF349	AD	3	05/17/1998		0.2 U	2 U	0.8	2 U	20 U	34.2	5 U	0.2 U	0.2 U	73
SF350	AD	3	05/18/1998		6	1.9	0.1 U	3 U	20 U	0.5 U	5 U	0.2 U	0.3 U	5 U
SF386	AD	2	11/19/1997		0.87	23.5	0.13	0.93	10 U	0.21	1.2	0.2 U	0.03 U	16.8
SF389	AD	2	11/19/1997		2.4	1.3	0.038	0.46	18	0.19	17	0.2 U	0.03 U	7.2

Data Summary Table
Upper South Fork - segment UpperSFCDRSeg01

Boxed Sample Results Exceed Screening Level By More Than 1X

Shaded Sample Results Exceed Screening Level By More Than 10X

Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Surface Water - Dissolved Metals (ug/l)														
SF390	AD	2	11/19/1997		0.51	0.35	0.02 U	0.29	10 U	0.062	1 U	0.2 U	0.03 U	1.2
SF394	AD	2	11/20/1997		0.98	1.7	0.041	0.16	10 U	0.12	**1870**	0.2 U	0.03 U	24.9
SF394	AD	4	05/15/1991				**0.7**			3 U				20 U
SF394	AD	5	10/04/1991				**0.4**			1 U				12 U
SF394	AD	3	05/17/1998		1.5	2 U	**1.1**	2 U	51	0.5	* **2180**	0.2 U	0.2 U	**314**
SF395	AD	2	11/20/1997		0.5 U	1	0.02 U	0.14	53.6	0.68	**612**	0.2 U	0.03 U	6.71
SF395	AD	3	05/18/1998		0.5 U	1 U	0.1 U	3 U	20 U	0.5 U	**271**	0.2 U	0.3 U	5 U
SF396	AD	2	11/20/1997		0.5 U	0.12	0.02 U	0.21	10 U	0.26	1.1	0.2 U	0.03 U	5.93
SF396	AD	3	05/19/1998		0.25 U	0.23 U	0.041 U	0.44 U	22.4 J	0.12 J	0.36 J	0.16 U	0.042 U	5.8 J
SF398	RV	3	05/13/1998		0.28 J	0.31 J	0.34 J	0.61 J	50 J	**1.1 J**	11 J	0.16 U	0.042 U	**83.5**
SF607	OF	8	03/24/1998		45 U	40 U	2 U	3 U		**61**	**280**		4 U	**66.8**
SF607	OF	8	01/03/1996				**2**			**35**				**445**
SF607	OF	8	01/10/1996				**3**			**54**				**387**
SF607	OF	8	01/17/1996				**4**			**52**				**500**
SF607	OF	8	01/24/1996							**85**				**511**
SF607	OF	8	01/31/1996				**6**			* **127**				**553**
SF607	OF	8	02/07/1996				**5**			**73**				**752**
SF607	OF	8	02/14/1996				**4**			**92**				**450**
SF607	OF	8	02/21/1996				**2**			**71**				**413**
SF607	OF	8	02/28/1996							**67**				**430**
SF607	OF	8	03/06/1996							**71**				**461**
SF607	OF	8	03/13/1996				**3**			**73**				**554**
SF607	OF	8	03/20/1996				**3**			**53**				**678**
SF607	OF	8	03/27/1996							**88**				**620**
SF609	OF	8	03/24/1998		**54**	40 U	2 U	3 U		**40**	**502**		4 U	**314**
SF609	OF	8	12/21/1994				**4**			**33**				**361**
SF609	OF	8	12/28/1994				**6**			**52**				**437**
SF609	OF	8	01/04/1995				**4**			**50**				**434**
SF609	OF	8	01/11/1995				**5**			**71**				**485**
SF609	OF	8	01/18/1995				**3**			**59**				**529**
SF609	OF	8	01/25/1995				**3**			**67**				**522**
SF609	OF	8	01/03/1996							**58**				**272**
SF609	OF	8	01/10/1996							**79**				**71**
SF609	OF	8	01/17/1996							**63**				**232**
SF609	OF	8	01/24/1996							**76**				**144**
SF609	OF	8	01/31/1996							**96**				**158**
SF609	OF	8	02/07/1996							**80**				**1540**

Data Summary Table
Upper South Fork - segment UpperSFCDRSeg01

Boxed Sample Results Exceed Screening Level By More Than 1X

Shaded Sample Results Exceed Screening Level By More Than 10X

Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Surface Water - Dissolved Metals (ug/l)														
SF609	OF	8	02/14/1996				**2**			**88**				**284**
SF609	OF	8	02/21/1996							**97**				**160**
SF609	OF	8	02/28/1996							**88**				**92**
SF609	OF	8	03/06/1996							**101**				**90**
SF609	OF	8	03/13/1996							**95**				**168**
SF609	OF	8	03/20/1996							**98**				**182**
SF609	OF	8	03/27/1996							**69**				**222**
SF650	RV	18	05/24/1999				1 U		7.4	1 U	6.6			7.1
SF8106	RV	13	---				2.3 U	**10**	3.7 U		1.2 U			3.1
SF8128	WL	13	---				2.3 U	**260**	3.7 U		13			3.9
SF8129	AD	13	---				**2.6**	8.4 U	3.7 U		1.2 U			2.5 U
SF8130	AD	13	---				2.3 U	8.4 U	3.7 U		1.2 U			2.5 U
SF8131	AD	13	---				2.3 U	**15**	3.7 U		3			2.5 U
SF8132	AD	13	---				2.3 U	**16**	3.7 U		2.9			2.5 U
SF8133	AD	13	---				**3.4**	**18**	8		3.8			2.5 U
SF8134	WL	13	---				2.3 U	**14**	3.7 U		2.4			2.5 U
SF8221	AD	13	---				**2.5**	**16**	3.7 U		3			2.5 U
SF8222	AD	13	---				2.3 U	**15**	50		**270**			2.5 U
SF8223	RV	13	---				2.3 U	**13**	3.7 U		3			2.5 U
SF8224	AD	13	---				2.3 U	**13**	14		3			2.5 U
SF8252	AD	13	---				**4.4**	8 U	12		5			2.5 U

ATTACHMENT 3
Statistical Summary Tables for Metals

Statistical Summary of Total Metals Concentrations in Surface Soil
Segment UpperSFCDRSeg01
Units: mg/kg

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	Coefficient of Variation	Screening Level (SL)	Quantity Exceeding 1X the SL	Quantity Exceeding 10X the SL	Quantity Exceeding 100X the SL
Antimony	13	13	1.2	3,150	300	2.86	31.3	6	1	1
Arsenic	20	17	5.6	3,010	290	2.44	22	15	2	1
Cadmium	20	20	0.51	225	33.4	1.61	9.8	10	1	0
Copper	20	20	11	3,100	584	1.33	100	14	3	0
Iron	20	20	4,400	207,000	53,700	1.06	65,000	4	0	0
Lead	35	35	78	65,700	11,900	1.22	171	32	25	10
Manganese	20	20	185	27,700	4,730	1.39	3,597	6	0	0
Mercury	13	13	0.05	37.2	8.14	1.43	23.5	2	0	0
Silver	13	13	0.69	145	50.5	1.04	391	0	0	0
Zinc	20	20	15	39,400	5,380	1.72	280	13	7	1

Statistical Summary of Total Metals Concentrations in Subsurface Soil
Segment UpperSFCDRSeg01
Units: mg/kg

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	Coefficient of Variation	Screening Level (SL)	Quantity Exceeding 1X the SL	Quantity Exceeding 10X the SL	Quantity Exceeding 100X the SL
Antimony	15	15	7	1,700	301	1.69	31.3	12	3	0
Arsenic	15	15	118	2,940	712	1.49	22	15	7	3
Cadmium	15	15	3.2	543	108	1.44	9.8	12	4	0
Copper	15	15	22.2	658	346	0.66	100	12	0	0
Iron	15	15	22,400	225,000	94,500	0.79	65,000	7	0	0
Lead	45	45	279	52,200	13,700	0.99	171	45	40	15
Manganese	15	15	102	27,500	10,400	1.01	3,597	10	0	0
Mercury	15	14	0.13	51.5	17.1	0.89	23.5	4	0	0
Silver	15	15	2.7	120	54.1	0.69	391	0	0	0
Zinc	15	15	62.6	83,900	16,700	1.43	280	12	12	2

Statistical Summary of Total Metals Concentrations in Sediment
Segment UpperSFCDRSeg01
Units: mg/kg

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	Coefficient of Variation	Screening Level (SL)	Quantity Exceeding 1X the SL	Quantity Exceeding 10X the SL	Quantity Exceeding 100X the SL
Antimony	19	4	0.948	50	23.1	0.9	3.3	3	1	0
Arsenic	19	19	3.19	214	27	1.8	13.6	8	1	0
Cadmium	19	19	0.067	112	15.5	1.97	1.56	14	4	0
Copper	19	19	9.81	283	107	0.73	32.3	16	0	0
Iron	19	19	6,160	129,000	40,400	0.99	40,000	6	0	0
Lead	19	19	31.1	23,500	4,060	1.79	51.5	16	13	4
Manganese	19	19	391	15,700	4,090	1.16	1,210	15	3	0
Mercury	19	18	0.0533	26	2.03	2.99	0.179	11	3	1
Silver	19	19	0.17	54.3	8.86	1.56	4.5	7	1	0
Zinc	19	19	58.7	16,300	2,970	1.54	200	17	5	0

Statistical Summary of Total Metals Concentrations in Surface Water
Segment UpperSFCDRSeg01
Units: ug/L

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	Coefficient of Variation	Screening Level (SL)	Quantity Exceeding 1X the SL	Quantity Exceeding 10X the SL	Quantity Exceeding 100X the SL
Antimony	92	26	0.24	19	2.73	1.37	6	3	0	0
Arsenic	104	36	0.2	41	3.08	2.55	50	0	0	0
Cadmium	414	254	0.1	73.2	3.22	1.67	2	104	1	0
Copper	110	41	0.16	550	25	3.88	1	24	6	2
Iron	106	55	10	1,400	246	1.46	300	12	0	0
Lead	433	370	0.097	922	49.5	1.64	15	182	17	0
Manganese	119	86	0.65	2,660	195	2.43	50	33	9	0
Mercury	109	3	0.32	0.5	0.38	0.27	2	0	0	0
Silver	97	3	0.8	7.7	5.23	0.74	100	0	0	0
Zinc	433	368	0.94	11,000	268	2.45	30	306	60	1

Statistical Summary of Dissolved Metals Concentrations in Surface Water
Segment UpperSFCDRSeg01
Units: ug/L

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	Coefficient of Variation	Screening Level (SL)	Quantity Exceeding 1X the SL	Quantity Exceeding 10X the SL	Quantity Exceeding 100X the SL
Antimony	86	36	0.17	54	3.08	2.88	2.92	5	1	0
Arsenic	86	44	0.11	23.5	1.27	2.85	150	0	0	0
Cadmium	299	176	0.038	72.3	2.49	2.45	0.38	158	28	1
Copper	99	41	0.14	551	24.5	3.81	3.2	17	2	1
Iron	106	35	5.9	69.8	29.7	0.62	1,000	0	0	0
Lead	302	185	0.062	589	20.4	2.49	1.09	150	48	2
Manganese	108	58	0.07	2,180	156	2.69	20.4	21	10	1
Silver	85	1	0.7	0.7	0.7	< 0.001	0.43	1	0	0
Zinc	316	269	1.2	11,200	257	2.97	42	179	36	1

ATTACHMENT 4
Screening Levels

SCREENING LEVELS

Based on the results of the human health and ecological risk assessments, 10 chemicals of potential concern (COPCs) were identified for inclusion and evaluation in the RI. The COPCs and appropriate corresponding media (soil, sediment, groundwater, and surface water) are summarized in Table 1. For each of the COPCs listed in Table 1, a screening level was selected.

The screening levels were used in the RI to help identify source areas and media of concern that would be carried forward for evaluation in the feasibility study (FS). The following paragraphs discuss the rationale for the selection of the screening levels.

Applicable risk-based screening levels and background concentrations were compiled from available federal numeric criteria (e.g., National Ambient Water Quality Criteria), regional preliminary remediation goals (PRGs) (e.g., EPA Region IX PRGs), regional background studies for soil, sediment, and surface water, and other guidance documents (e.g., National Oceanographic and Atmospheric Administration freshwater sediment screening values). Selected RI screening levels are listed in Tables 2 through 4.

For the evaluation of site soil, sediment, groundwater, and surface water chemical data, the lowest available risk-based screening level for each media was selected as the screening level. If the lowest risk-based screening level was lower than the available background concentration, the background concentration was selected as the screening level.

Groundwater data are screened against surface water screening levels to evaluate the potential for impacts to surface water from groundwater discharge.

For site groundwater and surface water, total and dissolved metals data are evaluated separately. Risk-based screening levels for protection of human health (consumption of water) are based on total metals results, therefore, total metals data for site groundwater and surface water were evaluated against screening levels selected from human health risk-based screening levels. Risk-based screening levels for protection of aquatic life are based on dissolved metals results, therefore, dissolved metals data for site groundwater and surface water were evaluated against screening levels selected from aquatic life risk-based screening levels.

Table 1
Chemicals of Potential Concern

Chemical	Human Health COPC			Ecological COPC		
	Soil/Sediment	Groundwater	Surface Water	Soil	Sediment	Surface Water
Antimony	X	X				
Arsenic	X	X	X	X	X	
Cadmium	X	X	X	X	X	X
Copper				X	X	X
Iron	X					
Lead	X	X	X	X	X	X
Manganese	X		X			
Mercury			X		X	
Silver					X	
Zinc	X	X	X	X	X	X

Table 2
Selected Screening Levels for Groundwater and Surface Water—Coeur d'Alene River Basin and Coeur d'Alene Lake

Chemical	Surface Water Total (µg/L)	Surface Water Dissolved (µg/L)	Groundwater Total (µg/L)	Groundwater Dissolved (µg/L)
Antimony	6[a]	2.92[b]	6[a]	2.92[b]
Arsenic	50[a]	150[c,d]	50[a]	150[c,d]
Cadmium	2[e]	0.38[b]	2[e]	0.38[b]
Copper	1[e]	3.2[c,d]	1[e]	3.2[c,d]
Iron	300[a]	1,000[c,d]	300[a]	1,000[c,d]
Lead	15[a]	1.09[b]	15[a]	1.09[b]
Manganese	50[a]	20.4[b]	50[a]	20.4[b]
Mercury	2[a]	0.77[c,d]	2[a]	0.77[c,d]
Silver	100[a]	0.43[c,d]	100[a]	0.43[c,d]
Zinc	30[e]	42[c,d]	30[e]	42[c,d]

[a]40 CFR 141 and 143. National Primary and Secondary Drinking Water Regulations. U.S. EPA Office of Water. Office of Groundwater and Drinking Water. http://www.epa.gov/OGWDW/wot/appa.html. October 18, 1999.
[b]Dissolved surface water 95th percentile background concentrations calculated from URS project database.
[c]Freshwater NAWQC for protection of aquatic life are expressed in terms of the dissolved metal in the water column.
[d]Freshwater NAWQC for cadmium, copper, lead, silver, and zinc are expressed as a function of hardness (mg/L of CaCO3) in the water column.
Values above correspond to a hardness value of 30 mg/L.
[e]Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota: 1996 Revision. U.S. Department of
Energy. Office of Environmental Management. ES/ER/TM-96/R2. Value based on total metals concentration.

Note:
µg/L - microgram per liter

Table 3
Selected Screening Levels for Surface Water—Spokane River Basin

Chemical	SpokaneRSeg01		SpokaneRSeg02		SpokaneRSeg03	
	Surface Water Total (µg/L)	Surface Water Dissolved (µg/L)	Surface Water Total (µg/L)	Surface Water Dissolved (µg/L)	Surface Water Total (µg/L)	Surface Water Dissolved (µg/L)
Antimony	6[a]	2.92[b]	6[a]	2.92[b]	6[a]	2.92[b]
Arsenic	50[a]	150[c]	50[a]	150[c]	50[a]	150[c]
Cadmium	2[e]	0.38[b]	2[e]	0.38[b]	2[e]	0.38[b]
Copper	1[e]	2.3[c,d]	1[e]	3.8[c,d]	1[e]	5.7[c,d]
Iron	300[a]	1,000[c]	300[a]	1,000[c]	300[a]	1,000[c]
Lead	15[a]	1.09[b]	15[a]	1.09[b]	15[a]	1.4[c,d]
Manganese	50[a]	20.4[b]	50[a]	20.4[b]	50[a]	20.4[b]
Mercury	2[a]	0.77[c]	2[a]	0.77[c]	2[a]	0.77[c]
Silver	100[a]	0.22[c,d]	100[a]	0.62[c,d]	100[a]	1.4[c,d]
Zinc	30[e]	30[c,d]	30[e]	50[c,d]	30[e]	75[c,d]

[a]40 CFR 141 and 143. National Primary and Secondary Drinking Water Regulations. U.S. EPA Office of Water. Office of Groundwater and Drinking Water. http://www.epa.gov/OGWDW/wot/appa.html. October 18, 1999.
[b]Dissolved surface water 95th percentile background concentrations calculated from URS project database. Technical Memorandum. Estimation of Background Concentration in Soils, Sediments, and Surface Waters. Coeur d'Alene Basin RI/FS. URS. May 2001.
[c]Freshwater NAWQC for protection of aquatic life are expressed in terms of the dissolved metal in the water column.
[d]Freshwater NAWQC for cadmium, copper, lead, silver, and zinc are expressed as a function of hardness (mg/L of CaCO3) in the water column.
[e]Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota: 1996 Revision. U.S. Department of Energy. Office of Environmental Management. ES/ER/TM-96/R2. Value based on total metals concentration.

Note:
µg/L - microgram per liter

Table 4
Selected Screening Levels—Soil and Sediment

Chemical	Upper Coeur d'Alene River Basin		Lower Coeur d'Alene River Basin		Spokane River Basin	
	Soil (mg/kg)	Sediment (mg/kg)	Soil (mg/kg)	Sediment (mg/kg)	Soil (mg/kg)	Sediment (mg/kg)
Antimony	31.3[a]	3.30[b]	31.3[a]	3[c]	31.3[a]	3[c]
Arsenic	22[b]	13.6[b]	12.6[b]	12.6[b]	9.34[b]	9.34[b]
Cadmium	9.8[d]	1.56[b]	9.8[d]	0.678[b]	9.8[d]	0.72[b]
Copper	100[d]	32.3[b]	100[d]	28[c]	100[d]	28[c]
Iron	65,000[b]	40,000[c]	27,600[b]	40,000[c]	25,000[b]	40,000[c]
Lead	171[b]	51.5[b]	47.3[b]	47.3[b]	14.9[b]	14.9[b]
Manganese	3,597[b]	1,210[b]	1,760[a]	630[c]	1,760[a]	663[b]
Mercury	23.5[a]	0.179[b]	23.5[a]	0.179[b]	23.5[a]	0.174[c]
Silver	391[a]	4.5[c]	391[a]	4.5[c]	391[a]	4.5[c]
Zinc	280[b]	200[b]	97.1[b]	97.1[b]	66.4[b]	66.4[b]

[a]U.S. EPA Region IX Preliminary Remediation Goals for Residential or Industrial Soil http://www.epa.gov/region09/wasate/sfund/prg. February 3, 2000.
[b]Technical Memorandum. Estimation of Background Concentration in Soils, Sediments, and Surface Waters. Coeur d'Alene Basin RI/FS. URS. May 2001.
[c]Values as presented in National Oceanographic and Atmospheric Administration Screening Quick Reference Tables, NOAA HAZMAT Report 99-1, Seattle, WA. M. F. Buchman, 1999. Values generated from numerous reference documents.
[d]Final Ecological Risk Assessment. Coeur d'Alene Basin RI/FS. Prepared by CH2M HILL/URS for EPA Region 10. May 18, 2001. Values are the lowest of the NOAEL-based PRGs for terrestrial biota (Table ES-3).

Note:
mg/kg - milligrams per kilogram